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A JOURNEY ACROSS ASIA FROM LEH TO PEKING.*

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In a paper published in the *Geographical Journal*, January, 1906, some instructive remarks were made on "the Present Problems of Geography." A plea was there put forward on behalf of the non-specialist; and to travellers such as Captain Layard and myself, with aims and intentions of the best kind, yet who in so many ways lack the necessary geographical education to enable them to fulfil those aims, there is much comfort to be found in this plea. After defining geography as "the Science which deals with the forms of relief of the Earth's crust, and with the influence which these forms exercise in the distribution of all other phenomena," the author of the paper continues, "It is convenient and often profitable for a man of science to have a recognized label, but it seems to me that important advances are to be made by cultivating those corners of the field of knowledge which lie between the patches where the labelled specialists toil in recognized and respected supremacy." It is in these words that I find the only justification for venturing to attempt to lay before you the results of a journey across Asia, in the hope that we shall have been found to have cultivated, in however small a degree, some of the "corners of the field of knowledge" above referred to.

The course of the journey which you will hear of to-night may be best described as one of length without breadth. Its object was not the exploration of any one tract or country in detail, but, in the first place, the acquisition of whatever knowledge, geographical and otherwise, it was possible to collect of the regions through which we passed,

* Read at the Royal Geographical Society, January 28, 1907. Map, p. 700.

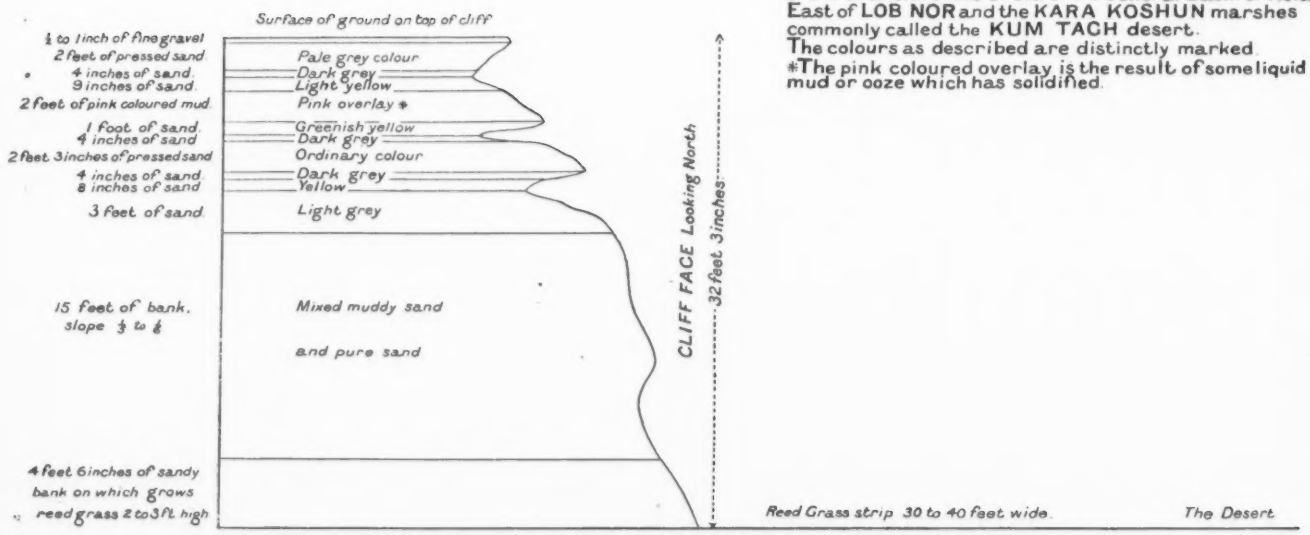
and, in the second, the making of a more or less detailed route-survey, day by day, mile by mile, from Leh to Peking. The second, and by far the more arduous of the two objects, was only carried through thanks to the wonderful determination and pluck of our Indian surveyor, a Sikh, Lall Sing by name, lent by the Survey of India. To carry on such work as Lall Sing did daily, with frequent night observations at altitudes over 16,000 feet in Northern Tibet so late in the year as the middle of October, moving nearly every day for nine months on end, is a feat which any man, even with the reputation which those who work for the Survey of India enjoy, may, I think you will agree, well be proud of.

That portion of the continent of Asia traversed by us between Leh and Peking divides itself naturally, from the geographical point of view, into three distinct parts. The first comprises the tract between Leh in Ladak and the Kuen Lun mountains, including the Chang Chenmo and North-Western Tibet. The second, which occupied us nearly three months, was entirely made up of Chinese Turkestan; and the third includes the latter portion of our journey through China proper, which lasted three months.

Over the first portion, from Leh to the Kuen Lun, previous exploration has been chiefly confined to various surveys and attempts to obtain an alternative route between Ladak, or Rudok, and Chinese Turkestan, for such seems to have been the idea actuating some of those who have faced this inhospitable country. From the time when Dr. Thompson, the associate of Cunningham and Henry Strachey in the Ladak boundary commission of 1847, first surmounted the Karakoram range, and that of the Schlagentweit brothers, one of whom was murdered at Kashgar, this wild region has always exercised a fascination peculiar to itself.

The country included in the second portion of our journey, viz. Chinese Turkestan, is now, after many years of comparative obscurity, once more attracting renewed attention. Fifteen hundred years ago there was a route which follows the southern border of the central desert of Chinese Turkestan, edging its way along the northern base of the Kuen Lun range. This route was then as well known, at any rate to the Chinese who controlled it, as it is to-day, and the reason is this: At the commencement of our era Buddhism first began to find its way to China from India, and ancient Chinese records prove that it was chiefly by the passage to and fro along this very route of many devotees, priests, and pilgrims that the transformation took place.

According to Chinese annals the best known of these pilgrims were two travellers of that race—Fa Hien, who passed from China to India about 450 A.D., and Hiuẹn Tsiang, who went and came two centuries later. Both were born travellers, and both have left records as interesting as they are authentic. About 1270 A.D. came the greatest traveller of all, Sieur Marco Polo. After traversing part of what is now Afghanistan,


Surface of ground on top of cliff
½ to 1 inch of fine gravel
2 feet of pressed sand
4 inches of sand
9 inches of sand
2 feet of pink coloured mud
1 foot of sand
4 inches of sand
2 feet 3 inches of pressed sand
4 inches of sand
8 inches of sand
3 feet of sand
15 feet of bank, slope ⅓ to ⅛
4 feet 6 inches of sandy bank on which grows reed grass 2 to 3 ft high
Pale grey colour
Dark grey
Light yellow
Pink overlay *
Greenish yellow
Dark grey
Ordinary colour
Dark grey
Yellow
Light grey
Mixed muddy sand
and pure sand
CLIFF FACE Looking North
32 feet 3 inches
Reed Grass strip 30 to 40 feet wide.
The Desert

Exposed rough section of Sand Cliff forming Southern shore of ancient lake or sea of the Central Basin of Asia. East of LOB NOR and the KARA KOSHUN marshes commonly called the KUM TAGH desert.
The colours as described are distinctly marked.
*The pink coloured overlay is the result of some liquid mud or ooze which has solidified.

Where the surface of the desert is rolling sand, now frozen hard, the direection of the lesser ridges is uniformly at right angles to the prevailing N.E. Wind.

he struck down from Badakshan to Kashgar, and continued eastwards through Khotan, Kiria, and Lob Nor to Sachu—by our very route. The journey ended in his case at Shangtu (the then summer residence of Kublai Khan), 300 miles north of Peking, outside the Great Wall. In modern times the names of Prjevalsky, Roborovsky, Kozloff, as well as other gallant Russian explorers, are intimately associated with southern Chinese Turkestan. Another famous European traveller, Sven Hedin, it need hardly be said, has made his name a household word throughout the whole central desert basin. And the names of four intrepid Frenchmen, Bonvalot, Grenard, Dutreuil de Rhins, and Prince Henri d'Orleans, will always be connected with that region. Of English men and women, Captain Deasy, Mr. and Mrs. Littledale, Bower, and Malcolm are well known among determined explorers who have passed that way; and Dr. Stein, the eminent archæologist, is even now continuing those fascinating explorations which have already done so much to confirm and explain early Chinese records.

The third part of our journey was through China proper. Although it might seem as if that portion should be by far the best known of all, curious as it may appear—this is not the case. The route from Chia-yu-kuan, the ancient north-west "gate" of China, where in early times all embassies from the west were forced to await the pleasure of the mighty emperors of Cathay, up to Lan Chou, the capital of Kan-su province on the Yellow river, has not been traversed by more than a dozen Englishmen in the last fifty years. Of that number, the name of Colonel Mark Bell stands out pre-eminently. From Lan Chou to Tai-Yuan Fu, the route we followed across East Kan-su, Shen-Hsi, and Shan-Hsi provinces to Peking, though comparatively close to civilization, is little known, for in not a few villages entered we were told that Europeans had never before been seen.

This, in brief, is an outline of the whole journey, and I will now endeavour to describe in some detail the leading physical features of the country along our route.

Leh, the capital of Ladak, is well known as the starting-point of, or the goal for, most Central Asian expeditions. It is here that caravans must be made up; food, animals, and men bought and hired; and it is not until Leh has been left behind that the traveller feels that he has cut the painter which has hitherto tied him to civilization.

From Leh to the Tibetan border, including the Chang Chenmo, the country is, comparatively speaking, well known. After surmounting in succession three high passes, the Chang La of 17,000 feet, the Masemik La of 17,600 feet, and the Lanak La of 17,750 feet, the Tibet border is reached. Two out of the three passes, though high, present no difficulty, when as we crossed them there was no snow. How simple the passage is may be imagined when it is stated that, riding on in advance of the caravan, I arrived at the summit of the Masemik La without any idea

that the top of the pass had been reached. On entering Tibet proper, very little change in the aspect or physical character of the land is to be found. As in the Chang Chenmo, so in Tibet, the same open undulating valleys have to be crossed. Common to both sides of the border are the high plateaux, whose surrounding ranges reach over 17,000 feet, the dividing passes, and the trickling streams, which so rapidly disappear into the thirsty soil. One new feature is met with in the lakes, some of which are fresh, others distinctly salt. There are also many ancient lake-beds plainly marked, where the evidence of previous glacial action may usually be traced.

SURVEYOR LALL SING AND RAI SAHIB AT WORK ON THE TOP OF LANAK LA, 17,750 FEET.

Of vegetation in North-West Tibet there is no sign save two or three kinds of poor grass, and the "boortsa" so necessary for fuel. Animal life, though at first common, practically disappeared as we drew up to the southern side of the Kuen Lun range. Tibetan antelope covered some of the less inhospitable valleys, and kyang, the wild ass, were not infrequent. During the whole of our stay in Tibet, only one wild yak was seen, and he, unfortunately for himself, paid for the meeting with his life, as meat that day was an absolute necessity for the caravan. Of the human race or its habitations we found no sign. From the day the Tibetan border was crossed until the gorges of the Kuen Lun had been partly passed, no trace of human beings was seen, not even a black tent used by the nomads who roam the country farther south.

From the description I have given you, it will not be hard to imagine the wearying monotony of this lonely land, and it might be supposed that Nature would have taken little pains to hedge it off from the neighbouring world. But this is far from being the case. On the northern side she has planted, in the shape of the dreaded Kuen Lun mountains, such a barrier that even the daring Russian explorers already alluded to were fain to allow themselves baffled in their attempts to find a feasible route other than the one we used.

Upon the immediate southern side of the Kuen Lun we were compelled to halt to refit and rest our animals in the only possible spot, known to the natives of Polu as the Baba Hatten valley, where so late in the year some little grazing could still be got.

For two days previous to entering the Baba Hatun valley, our way had lain over perhaps the worst ground we had to cross in Tibet. West of the valley we were following ran a magnificent range of eternally snow-clad mountains, whose highest peaks, which later form one boundary of the Baba Hatun valley, reach over 21,000 feet. Such a landmark do these form that, though no new discovery was involved, we felt that as a geographical feature they ought to carry a separate name. We therefore took the liberty of giving them that of the Curzon range. Opposite to this latter, on the north-east side of the same valley, stands a wonderful group of rugged peaks and ridges also covered with eternal snows. Both offer on either hand as grand and awe-inspiring a view as the human eye could wish for. We again felt that such a unique mass of peaks deserved recognition and a separate entity, so took the liberty of giving it the name of the Kitchener group.

Leaving the Baba Hatun valley by a difficult pass called the Ak-Su La, we camped the next night but one on what is known as the Gu Gut plain. This is a wide open expanse, some 18 miles in length from east to west, with a greatest breadth of 6 to 7 miles from north to south. It is surrounded on all sides by high rugged ranges, some of whose snow-clad cliffs reach over 18,000 feet. They afforded a magnificent view as the sun gained power at midday, lighting up their needle-like peaks in all the wonderful purity these fascinating snow-fields present.

Reference has already been made to the prevalence of old lake-beds in this portion of north-west Tibet, and the Gu Gut plain presents as reasonable an example of the physical geography of these on a larger scale as any. In extent, some 18 miles by 7, the plain is bordered on its northern sides by main ridges of the Kuen-Lun range, which reach over 17,000 feet. Both at the east and west ends the surrounding mountains are lower. The western half of the plain differs entirely in character from the eastern. The former is flat gravelly shingle, rising gradually north and south to the mountains on either side. The eastern portion is not flat, but consists, on its southern side, of a series of ridges and hollows running in all directions, most distressing to pack-animals.

These ridges vary from 20 to 60 feet in height, occasionally bursting into small hills running up to 100 feet above the plain. Both hollows and ridges are thickly sown with an outcrop of volcanic-looking black rock, which makes progress by no means easy.

On the south side of the plain lie three small lakes, the largest some 3 miles by 2 in area, and these are separated from one another by as much as 4 miles in the case of the two most eastern lakes. Ulug Kul, the first lake, so called by Deasy—our guide knew no name—is salt, and on October 15, though at an elevation of 15,200 feet, it was quite free from ice. Atchik-Kul, the second, at its eastern end, tasted sufficiently salt to be unpleasant to men. The animals, however, drank it greedily,

NEAR LOB NOR. MIDDAY REST AT A WATER-HOLE.

not having had any water the previous day. In contrast to Ulug Kul, this lake was frozen almost completely over. At the west end, where we subsequently camped, the water from a channel connected with the lake was quite sweet. All the lakes are either shrinking, which does not appear probable from the surrounding indications, or at other seasons must be 5 or 6 feet above their then level.

The following day we crossed what has all the appearance of an old lake-bed, as we made for the mountains forming the northern border and barrier of the plain. In this plain and rising above these channels in the dry pond-like beds are irregular-shaped pillars and mounds, showing in places what would appear to be an older level of at least

15 feet above the present one. From the general aspect of the southern surface of the plain sufficient indications are found to show that the whole lower side of the Gu Gut plain may once have been one large lake. How long ago, if ever, is a matter for the specialist to decide.

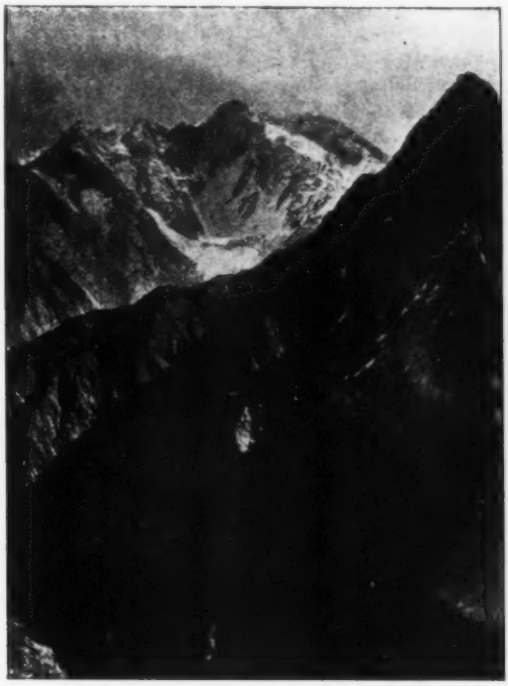
From the northern edge of the plain the actual passage of the Kuen Lun mountains commences. This passage occupied us five days, and we covered just over 30 miles in transit. It was 2 p.m. by the time we had climbed the first pass out of the Gu Gut plain, and much too late at that season of the year to commence such a descent as that which lay before us. This pass was not that made use of by Deasy, as, our guide being most uncertain about any possible passes, we had ourselves pushed ahead, and Captain Layard, Lall Sing, and myself climbed a pass the caravan were afterwards unable to negotiate. Upon the north side the snow lay 18 inches to 2 feet deep, and there a wind raged which was, even for Tibet, more cruel than usual. After rejoining the caravan, the view which met our eyes as we gazed through the falling snow northwards into and over the Kuen Lun, was one neither my companions nor myself are ever likely to forget. Below and on three sides of us, stretching apparently without end, lay the wildest and most forbidding jumble of mountain ranges, peaks, and gorges imaginable. Of all shapes—crossing and recrossing in every direction, needle-pointed, flat, or rugged and broken, they had only one common feature, and that lay in their apparently inaccessible nature. There was, however, no time to waste, whatever doubts for the moment crept through our minds, it was imperative to go on, so we commenced the first descent down a slope like the side of a house, full of holes and boulders, and over the knees of the animals in snow.

For the next four days we struggled down a succession of water-courses and narrow gorges one after another, making sorry progress at times, but always in the right direction. The main gorge, known to the people of Polu at its northern end as the Zubéshie gorge, was more like a gigantic railway cutting winding through solid rock than anything else, the sides frequently sheer for hundreds of feet on either side, the bottom just sufficiently wide for a frozen brook a few yards in breadth. Into these gorges the sun rarely penetrates, and at night, when the moon is overhead, few more weird and desolate scenes can be imagined.

Though of no importance geographically, it may be of interest, perhaps, in order to show the difficulties of progress, to state that on one of the four days the caravan could only cover 1¼ mile, and this took over four hours, at the end of which time men and animals were quite exhausted from constantly unloading and reloading every single pack. Another day 7 miles was the result of nearly ten hours' severe labour. In fact, had not the Beg, or local headman of Polu, sent out

a party of men and donkeys to help us the last day, in all probability most of our animals would have left their bones among the mountains.

Of vegetation in the Kuen Lun there is practically none, and it was the want of even such miserable grass as had been scarce enough in Tibet that brought our animals to the state they had reached when we received help from the people of Polu. As we descended, the physical character of the surrounding mountains gradually changed.



VIEW OF MOUNTAIN PEAKS FROM THE FIRST PASS INTO THE KUEN LUN RANGE.

Slaty deposits replaced pure rock, while the lower spurs become shaly soft grey earth which the wind carries in clouds, causing a constant haze. Below 10,400 feet ice on the streams ceased, and between 10,000 and 9000 feet the first sign of vegetation in the shape of a few rushes, a few withered briars, and some wild clematis became apparent. It is difficult to refrain from smiling, even now, when one recalls our excitement on reaching a turn where the last bit of gorge opened out into something of a valley, for there in the distance was to be seen one

solitary stunted tree. It was the first we had met since leaving the Indus valley.

Clear of the gorge, the character of the country undergoes a startling and rapid transformation. Instead of the rock cutting and perpendicular cliffs, the track descends into rolling dust-coloured hills and open downs at a height of 8400 feet. These are covered with a small close-growing vetch, which in the spring probably affords excellent grazing. Not a vestige of trees, grass, or other vegetation is to be seen except this vetch. At a little distance away from the mountains and entrance to the gorge, the sudden geological change is still more apparent. The last jagged range, snow-clad throughout most of its height, gives way, almost as though in one step, to dust-coloured hills 2000 feet lower in altitude. These in their turn, as we descended after leaving Polu to Kiria, merge very gradually into rolling sand-hills, and our track passed through dunes and swelling hillocks of the same kind until the fertile oasis round Kiria is reached.

In discussing the loess formation of Northern China, Richthofen has traced its limits as far as the country through which he himself had travelled, and he remarks, "I do not positively know how far it extends in the direction of Central Asia." At the time of our passing Polu, I was impressed with the similarity in the constitution of the hill country immediately adjacent to the mountains to that of loess, and after travelling for months through the great loess country of Northern China, my impression is confirmed. It may be thought that the loess formation is not usually found at such an elevation, but Richthofen has also shown that "the difference of level of the places where loess occurs is truly remarkable. Where," he writes, "its hills fringe the plain of the Yellow river, they rise only a few hundred feet above the level of the sea. But in climbing up to higher regions, one never loses sight of the yellow soil. In Shan-Hsi," he continues, "I found it largely predominating over everything else at altitudes up to 6000 feet, and met it in many places of greater elevation on the Wu-tai Shan at 8000 feet. Where it adjoins a mountain range, deep cuts will expose layers of rocky *débris* intercalated more or less frequently between those of loess."

About the origin of the loess formation itself, opinions once certainly varied. Whether this is still the case I am unable to say, but our own experience, for what it is worth, goes to uphold the theory that the loess formation is not stratified, and has a tendency to vertical cleavage; also that it is not of subaqueous, but of subaërial origin.

Before passing on to the second portion of our journey, the country embraced under the name of Chinese Turkestan, a few words may be of interest concerning the gold industry of the Kuen Lun. During our struggle through the mountains we had been overtaken by two small parties of men, found later on to be residents of Polu and Kiria, the last of the gold-seekers who had proceeded into the mountains in the spring

of the year. We had noticed, all along the Zubéshie gorge, traces of their work in the shape of numerous "pockets," mostly disused. Some of these were to be seen in inaccessible-looking spots, up side ravines, and even high up in the faces of the almost sheer cliffs. The name "Zubéshie" means gold extracting, and, judging by the traces of workings to be seen, the name appears aptly chosen. The industry is carried on by natives of Polu and Kiria, whose custom it is for parties of three to five men to go up into the mountains in the spring, carrying with them only the absolute necessaries of life, and remaining just so long as they can make their provisions last, or until the approach of the winter and the snow drives them down again. Donkeys are occasionally taken to carry the small packs, but in most cases each man shoulders his own. A very hard life it is, and the attraction must be strong. East of Kiria, all along the northern base of the Kuen-Lun, gold is worked at intervals, to which reference will be made further on in this paper.

At Kiria the ancient Buddhist high-road previously mentioned is reached on the borderland of the Takla Makan desert, and the traveller finds himself on the edge of that wonderful Central Asian basin, which stretches for a distance of 2500 miles, from the Alai mountains as far east as the western slopes of the Khingan range in Manchuria.

In spite of what has already been done here in the way of exploration, it is more than possible that we are only beginning to unravel many of the archæological and historical mysteries connected with a former and far more flourishing state in the western half of this vast area. Few more fascinating scenes for such work are to be found in the present day. Unfortunately, China, which from its past history, and, in spite of Western criticism, its present wonderful state of general civilization, ought to be a subject of interest, especially to our countrymen, is even now a sealed book to the great majority. Why this should be so it is difficult to imagine. One reason, perhaps, lies in the difficulty—nay, almost impossibility to dwellers in Europe—of becoming acquainted with either its present or past records. Intimately connected as these records show China to have always been with the middle East, even as early as the first century, we in Europe have little knowledge of them, and until it is more widely realized how close this connection was with our own great Indian empire, and that almost entirely by means of the ancient route of which I am endeavouring to give you some idea to-night, interest in the early civilization of China, and from that in its latter history and future, will, I fear, be confined to a very limited number of inquirers.

The town of Kiria has been identified with the Pein of Marco Polo, who passed through it about A.D. 1274. From Kiria eastwards to the border of China proper, there were in the past two main routes. From Kiria to Chakalik, some 60 miles south-west of Lob Nor, one track goes almost in a straight line east-north-east down the Cherchen river.

The second, after leaving Kiria again, leads back to the base of the Kuen Lun mountains, and proceeds along the foot of the lowest spurs of the Altyn Tag to Chakalik. Historically, the former is of most interest, as it leads past the sites of various now buried cities, and undoubtedly is the former pilgrim route, but for other reasons we chose the mountain track after passing the town of Nia.

From Nia our next halt of any interest was at Sorghak, or, as it is locally pronounced, Sŏrrăk, which may be said to be the centre of the gold industry of this district. Though figuring in European maps, Sorghak is merely a collection of wattle-built semi-underground huts, dug in the soft loess soil. Some are regular caves. A more squalid place it would be hard to find; it has all the appearance of the mining camps which Bret Harte once familiarized us with, lack of water and an all-enveloping dust being its chief characteristics. The gold is worked by sinking narrow circular shafts, varying from 40 to 100 feet in depth. At the bottom of these a low tunnel is made at right angles to the shaft, 3 to 4 feet in height, and from $1\frac{1}{2}$ to 10 feet in width. The tunnel is dug through shaly sand and gravel, in which occasional rock outcrops. Ten to twelve men, women, and children work each hole. Some of them handle the rickety windlass by which one is lowered into the pit, others pick out the soil at the bottom of the tunnel, while the remainder sift it over when it reaches the surface. Owing to the absence of water, the soil is not washed, but winnowed on exactly the same lines as is grain throughout the East. The final process consists in spreading the residue of the already winnowed soil on felts, then carefully blowing each handful over in search of gold. A more primitive method of extracting the most valuable metal in the world could not be invented. That which their forefathers, the Mongol Kalmacks, who are said to have first worked this district, did a hundred years ago, so the native Turki does to-day. What result might be obtained by the application of European methods to the Kuen Lun industry, I am unable to state with any exactitude. Though an exceedingly interesting question, it is perhaps one more suitable for the gentlemen who attend meetings east of Temple Bar than for those who have honoured me to-night.

Beside gold seeking, this portion of Turkestan boasts few industries. A certain amount of "charras," the hemp which is the main article imported by Central Asian traders *viâ* Yarkand and the Karakoram route to India, is grown in the bigger oases, but the other articles which go to make up the straggling trade that route enjoys, such as felts, embroideries, silk for underwear, and skins, chiefly come from the neighbourhood of Khotan, Yarkand, and Kashgar.

In vegetation the oases are exceedingly rich. As fine fruit, grapes, apricots, melons, and apples are grown as any in Kashmir, and Indian corn thrives in all of them.

One of the most striking physical features of this district may be studied in the numerous mountain streams and small rivers which descend from the Kuen Lun northern slopes, all to be absorbed sooner or later by the remorseless sands, against which nothing in nature seems able to compete. Between Sorghak and Achan, a hamlet from whence we again turned north towards Cherchen, these streams occur almost every few miles. Alike in general character, varying only in size, the description of one is that of all. At the immediate foot of the lower mountain slopes the stream has usually cut for itself a deep rugged channel with frequently almost perpendicular sides. In height the latter vary from 60 to 200 feet, and in the case of the bigger streams

CROSSING THE FROZEN STREAM IN THE KUEN LUN GORGES.

equally steep hills raise their rounded tops another 400 to 500 feet on either side.

The gorges are void of all vegetation, and are wild and rocky to a degree. The descent into them and ascent is at times difficult, being down a zigzag tract just fit for pack-animals. In volume of water there would seem also considerable variation in these streams, but this is mainly a matter of catchment area in their upper sources. As we crossed them in November they must have been almost at their lowest; most were dry or frozen up. Some carried a mere trickle of water, and the remaining three or four were never so much as a foot deep. When in flood, as occurs at the spring snow-melting, they become, on the contrary, wild torrents whose volume is plainly to be seen in the huge

boulders carried down, and the gravelly soil or worn rock which at times form their sides and bed. As the streams descend into the lower and more open slopes, the gorges diminish in depth and the beds open out. Before reaching the sand of the approaching desert, in most places a wide bare glacis composed of very fine gravel has to be crossed. This formation is locally known as Sai, and during the passage across it of such streams as are not already absorbed, the channels spread out, as is the case immediately south-west of Nia, to a width of, at times, 2 to 2½ miles. Practically there is no channel, the flood water pouring down in numerous wide shallow branches. The third and final stage in the life of these mountain streams is reached when those which remain enter the sands of the desert proper, for their fate is then sealed. Local conditions enable some to continue the hopeless struggle a little longer than others, but the tombstone of all, if it may be so expressed, is eventually a marsh where only the last signs of dead and dying vegetation remains.

At Achan we turned north to reach Cherchen, in order to descend the Cherchen Daria, which we proposed to follow to the point where it enters the Kara Koshun marshes. Some slight variation had later on to be made in this plan, and after quitting Cherchen we left the river about halfway down to make for Chakalik, the main oasis of these parts, and so situated as to be of no little importance geographically. Cherchen is the Charchan of Marco Polo, and is referred to by him as the capital of a district of the same name where "there are numerous towns and villages." In the present century we are now beginning to inquire where all these towns and villages are, for Marco Polo has long been proved to be a truthful man, and we find, as Dr. Stein has shown, and is even now continuing to prove, that they have almost all succumbed to the slow but remorseless attack of the desert sands. Whether these latter will be found to cover the buried treasures Egypt and Persia have yielded remains to be seen, and is unlikely, but it may with confidence be said that they have yet to disgorge a wealth of historical and perhaps ethnological remains to the intelligent explorer with time and energy to give to such an enticing task.

The Cherchen of to-day is a mean place of one rambling street, 150 to 200 yards long, with some wretched shops representing the usual Asiatic bazar. The people looked poorer and more unkempt than at any previous village we had passed, and the whole oasis has only an area of some 6 miles by 3. Old Cherchen stood 2½ miles south-west of the present site. There are considerable remains, and close to them is an ancient yet clearly marked river-bed with all the appearance of having been formerly a channel of the Cherchen Daria. From Cherchen, in order to keep on fresh ground as far as possible, we kept the right bank of the river until we quitted it.

Between Cherchen and Chakalik the country traversed is composed

of low scrub and strips of decaying forest, with, nearer the river, miles of reed jungle in which semi-stagnant or salt lagoons frequently occur. Animal life was here once more met with. The Mongolian or Prjevalsky's gazelle were not uncommon. They are locally known as Juggran. Maral stags and wild boar are also common, and the season when the tigers are most in evidence was just approaching. North of the river the sand dunes of the desert are seen close to the left bank, where they rise to a height of 30 to 35 feet.

A feature of the right bank of the Cherchen Daria is the number of disused ancient river-beds we crossed. One we camped in had a depth of 15 to 20 feet, with a width of 90 to 120 feet. The banks were lined with splendid old Tograk trees (poplars), whose age must, from their appearance and native tradition, run to hundreds of years. Sven Hedin has remarked upon the possibility of deducing the time when these channels held water from the age and state of decay of these giant trees, and no doubt they can and should help to determine such questions. What is perhaps of more interest is the fact that the Cherchen river, which still continues to flow, has in times past so often changed its channel, for after-experience proved to us that the marshes and lake-beds of this region have undoubtedly done and are still doing the same. The interest connected with this fact is chiefly based on the effect it may have in throwing additional light upon the yet unsettled problem of the situation of Lob Nor itself.

Even were time available to-night, the subject is one I should hardly venture to touch upon, so entirely has Sven Hedin in later years made the subject his own. The opinions of Prjevalsky, Richthofen, Kozloff, and others are well known, but in view of the scientific interest involved in the question of the inconstancy of all water channels in this basin, I may perhaps be allowed to quote one other case.

About lat. 94° E., on the Chinese side of the Kum Tagh desert, we explored a wide expanse of lagoon and lake known on our maps as Kara Nor. Here all the signs necessary to substantiate the inconstancy of such areas are very clearly marked. No two people who have examined Kara Nor and its ramifications would disagree in saying that both in area, depth, and actual position it never, for any length of time, remains constant. I venture to think no one who has seen that district, and is acquainted with the minute proofs to which Sven Hedin has put his theory, will again deny that not only Lob Nor, but the whole Kara Koshun basin wherever small lagoons and depressions exist, is in the same state.

It has been said that the geographical position of Chakalik is one of some importance, and a glance at the map will make this plain. The village, for it is no more, stands at a point where four routes meet, and though the traffic on any one of the four is insignificant, as we count it in Europe, it is none the less steady, and each track serves, as all tracks

in the East do, as a means of disseminating information slowly but surely over very wide distances. The first and most important is kept up between Chakalik and Urumtsi, the capital of the Hsin Chiang. This track runs *vid* Kurla down the Tarim river. The continuation of it south from Chakalik is equally important, as by it all the Buddhist pilgrims making for Lhasa from Central Asia enter Tibet over the Altyn Tagh.

While at Chakalik I met and talked with a traveller who had only twelve days before returned from Lhasa, where he had been as guide to a lama who had come from near Lake Balkash, in the Semipalatinsk province in Russia, to make the pilgrimage. Among other items of news from Lhasa, our friend told us that since the Younghusband expedition everybody there wore ammunition boots!

The other tracks from Chakalik are that by which we had approached that place, and a second, though one seldom used, continuing south and east to the Chinese border at Sachu. In addition to these four routes, Chakalik can be reached from China proper across the Kum Tagh desert, and this we had long ago decided to attempt. I have seen it stated, and believe it to be a fact, that the Chinese occasionally make use of this route. We had the greatest difficulty, however, in getting any information about it from the Chinese amban at Chakalik, who implored us not to attempt the desert crossing, saying that we should lose our lives if we did, and that the Korla-Urumtsi route was by far the safest. When, however, the amban saw that our minds were made up, he did all he could to help. He ordered the requisite number of men and camels to accompany us, settled the wages we were to pay, and, in fact, took general charge of the expedition.

Leaving Chakalik, we made for Abdal, a collection of reed huts or Satma, as they are called locally, where some fifteen families eke out a hard existence chiefly by fishing in the marshes. Abdal stands on the right bank of the Cherchen Daria, at a point where that river enters the Kara Koshun. The river is known locally as the Cherchen Daria, though it was described by an old man to me as uniting in itself the waters of four streams, viz. the Yarkand Daria, the Kucha Daria, and the Karasha Daria. Few more uninviting spots can be wished for than Abdal as we found it in mid-winter.

The approach from Chakalik is over a waste of sand-dunes and hollows covered with reed-grass. Dotted over the waste are bits of dead forest and huge root-heaps buried in sand. These mounds—like gigantic mole-heaps—are a feature of the southern edge of the desert, and are due to the action of the wind and sand on the vegetation whilst the latter was in course of being overwhelmed. Nearer Abdal the low jungle changes to open sandy hillocks devoid of all vegetation. Only the dead root-ends of brushwood stick up in a mournful way through the sand. A shallow lagoon, 2 miles wide, and various small lake-beds

show signs of lately holding water. The last 5 miles is across the most desolate, forsaken-looking waste imaginable; not a tree nor a blade of vegetation exists as far as the eye can reach. The surface of the ground must at certain times become a marsh. It is composed of rough heaps of mud and frozen earth. At Abdal the Cherchen Daria was frozen 5 or 6 inches thick. To the north, north-west, and north-east stretch the dreary-looking marshes with open bits of water which make up the Kara Koshun.

The crossing of the Kum Tagh desert appears to have been an undertaking even in the days of Marco Polo, at which time there is no doubt

ANCIENT REMAINS OF FORTIFIED POST (KURGAN) NEAR KARA NOR.

a highway of a kind did exist. Whether this highway ran *viâ* Leu Lan to Sachu, or further south, yet north of Lob Nor, is an undecided point. The description given of it by that wonderful traveller in the thirteenth century is chiefly confined to a mention of the unseen terrors and the evil spirits said to inhabit the desert. "Here," he says, "where its breadth is least, it takes a month to cross. 'Tis all composed of hills and valleys of sand, and not a thing to eat is to be found on it. . . . Beasts there are none, for there is nought for them to eat. But there is a marvellous thing related of this desert, which is, that when travellers are on the move by night, and one of them chances to lag behind or to fall asleep or the like, when he tries to gain his company again he will hear spirits talking, and will suppose them to be his comrades.

Sometimes the spirits will call him by name; and thus shall a traveller ofttimes be led astray so that he never finds his party. And in this way many have perished. Sometimes the stray travellers will hear, as it were, the tramp and hum of a great cavalcade of people away from the real line of the road, and, taking this to be their own company, they will follow the sound; and when day breaks they find that a cheat has been put on them, and that they are in an ill plight. . . . And sometimes you shall hear the sound of a variety of musical instruments, and still more commonly the sound of drums. So thus it is," he ends, "that the desert is crossed."

Quaint as the above reads, and little information as our traveller offers of the physical configuration of the desert east of Lob Nor, it will not be without interest to say that the remarks as to the sound of musical instruments and drums may have some foundation in fact, especially when we remember that the language he would use is that of the East, where slight exaggeration is considered an art, not a fault as in the West.

After quitting Abdal our route lay for a day along the edge of the marshes, everywhere frozen. To our camp that night on the edge of the ice weird sounds came floating from the marsh, which were, of course, nothing but the groaning and booming of the ice as it froze. Not being an Asiatic, I should describe it as the far-distant sound of trumpeting elephants, but Marco Polo's description is the more poetical of the two.

Between Abdal and Sachu the passage of the desert took us twenty-seven days. The chief difficulty is the lack of fresh water, but in winter this difficulty can to some extent be overcome by carrying ice. Not only did we depend on this at times for our water, but when there was no brushwood or not sufficient to enable us to make a fire to melt the ice for them, the animals were also fed on lumps of ice broken small, if fed is the right expression. The other difficulty is the lack of adequate grazing, and it was due to the want of food as much as to the general exposure that our animals began to succumb before we reached the farther edge of the desert. From the point of view of physical geography, the eastern end of the Lob Nor basin offers most interesting and convincing evidence of the theory that the whole basin was once a vast inland sea.

In the desert two days' east-north-east of Abdal our track struck the foot of sandy cliffs having buttress-like faces fronting to the north 35 feet in height, covered with gravel on the top. Along the foot of the cliffs runs a narrow strip of reed vegetation 30 to 40 yards wide, in which marshy spots are found, the water sometimes fit to drink, but usually not. After following the line of cliffs for a day, our guide struck away from them north-east into the bare desert, where there is no sign of vegetation, the surface being of the nature of the bottom of a pond

frozen hard as it dried up. It stretches thus to the horizon, except towards the east, where as far as the eye can reach the cliffs appear to run on.

On the following day our track once again ran under another line of cliffs, of the same kind as the first, but more to the north and higher, their scarped front being in places 60 feet above the desert. Continuing along the base of this second sea-shore, the cliffs became gradually less regular. Isolated hillocks like islands pushed themselves forward out into the desert, and later the same day, having quitted the shore-line and followed a course east-north-east, we once more struck a third and equally well-marked sea-coast, but this time our course lay along the top of a line of cliffs almost identical with the two previous ones.

On Christmas Day, 1905, our camp was pitched under a steep bluff in the face of the cliffs. As it happened, the formation of the various sand strata composing the cliff-face was very clearly marked at this spot, so our holiday was spent in making a careful section of the exposed face. For the next two days we maintained the same direction, viz. north-east and east-north-east uniformly, every day more strongly confirming the impression that we were travelling along the southern shore of some huge island sea. So strong is the impression, that it is impossible to describe this portion of the desert in any other language than that which would naturally be made use of were this the case. On the tenth day from Abdal, the character of the sea-shore begins to change somewhat. The lines of cliff give place to stony ridges, with here and there rock outcropping. The ridges, like the cliffs, are not of loose sand, but are of hard-pressed clean-cut sand, as if built. The surface of the desert here resembles a field which has been newly steam-ploughed, then frozen hard. The going is as bad as it could be.

Here for the first time since Abdal, the boundless horizon to the north was broken in the far distance by an indistinct line of hills. In this part of the desert water is an even greater source of anxiety, as we had invariably to dig for it, sometimes as deep as 8 to 10 feet. The result was usually a few inches of liquid of a kind, and for that, when it came, we were thankful. At other times good water-holes were discovered, one of the best on the last day of the old year, and as there were also some reed-grass and dried-root heaps, we decided to rest the animals on New Year's Day. Though in itself an insignificant matter, the formation of these dried heaps is of the utmost importance to travellers in the desert, for they afford the only fuel obtainable. The root-heaps near Abdal already referred to are found on a much smaller scale in the desert, and I venture to offer the following theory of their formation: They may be said to exist where marshy spots or springs are or have once been. Each bush drops its fronds, when dead in the autumn, directly into its own roots. This continues year after year, and each storm, or even the

ordinary high winds, blow the sand more and more into and on to the bushes. As the sand covers the fronds heaped at the roots and mixes with them, it so gradually turns them into the bush sand-heaps, which, while the bush still lives, have only the tops showing. When the bush is dead and the ceaseless struggle with the overwhelming sand is finished, the latter spreads over the top of the bush, from which, if one digs into it, roots may yet be brought up to form excellent fuel.

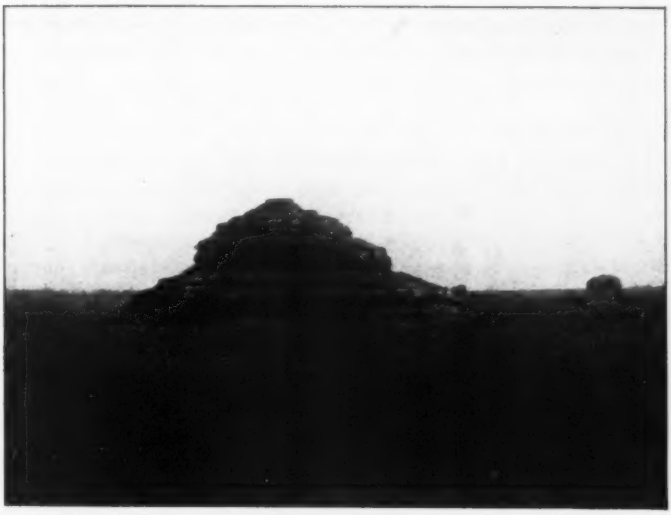
After the rest to our animals on New Year's Day, I was able the following one to temporarily quit the caravan and ride to the base of the northern range, the approach to which was found to be of the same character as that to the lower Kuen Lun ridges further west. The range itself rises precipitously to a narrow rugged ridge, and is composed of hard clay or mud, probably with sand below. There is no vegetation whatever. The general average of the range was under 800 feet above the level of the desert. The direction lies east-north-east to west-south-west, and it can only be one of the southern ridges of the Kuruk Tagh, but which, such maps as we possessed of this region led us to suppose, did not come nearly so far south.

After passing this spot, clay terraces and isolated hillocks, which have all the aspect of ancient ruined cities, but are really mounds of clay, become the feature of the desert on all sides. These mounds are of the most fantastic shapes, and have been worn into such resemblance to ruined walls, towers, and gateways that, even close at hand, one at first imagines they represent the ruins of long-lost settlements. The surface of the desert now consists of a series of depressions, separated either by rolling ridges of hard fine gravel, or divided from each other by clay terraces. Under the firm gravel the soft sand is still to be found, with a few sand-heaps dotted about. The faces of some of the terraces are cut into curious shapes by the action of the wind. In one place the northern side has been worn into a line of what looked exactly like gigantic tombstones.

Twenty days from Abdal we camped by a good water-hole in one of these local depressions, finding, much to our surprise, a clearly marked ancient river-bed, in which were a quantity of growing reeds and some brushwood. Leaving this camp, we were again astonished by suddenly coming upon an ancient watch-tower, or torla, the first sign that we had struck one of the old historical highways which are known to have been kept up by the Chinese centuries ago. A few miles east of this point, in lat. 40° 21′ 37″, commences what has been, and may at any time again be, the western end of Kara Nor, the lake already referred to.

The night we reached the edge of this lagoon was, unluckily for us, marked by one of the terrific storms locally called kara buran (black storm). We had turned in after a long march on foot, and were hardly into our bags before the storm broke over the camp. Anything like the force of the wind we had never before experienced.

Luckily, the tents were under a gentle rise, and made fast fore and aft to some small trees; the pegs, also, as was our custom, were anchored down by the yakdans placed on top of them. For five hours the tents swayed and rocked like boats at sea, threatening every moment to be blown clean away, and all that could be done was to cling tightly to the front pole, hoping that the additional weight might prevent the final catastrophe. The storm burst in mad gusts about 9 p.m., blew its hardest about 10 p.m., and, as we foolishly imagined, appeared to be subsiding at 11 p.m. Feeling the wind going down, we ventured to quit the tent-poles and to exchange confidences as to the damage so far as we could make ourselves heard. Hardly had we crept back into our



A NATURAL CLAY TOWER IN THE KUM TAGH DESERT.

rugs and gone off to sleep when we were once more awoke by the same terrific gusts and wild shaking of the tents. There was nothing to be done but to jump out into 25° of frost and again hang with all our weight on to the tent-pole. For another two and a half hours the gale raged, until we almost began to despair of keeping the wind out. Had the door-fastenings given, or one gust managed to get in, the whole tent would have gone. Luckily, neither of these things happened, and by half past 2 a.m. it was safe to creep back once more on to one's rugs, and this time for what was left of the night. Waking in the morning, there was no sign of wind or storm, and but for layer upon layer of fine sand which had penetrated everywhere, the whole kara buran might have been a nightmare.

In the morning we explored the lagoon, finding along its southern border the remains of another ancient watch-tower, one of a series of four visible from that point. The watch-towers are some 2 miles apart, well placed to be seen, and on a line nearly west and east. The first watch-tower is built of mud or clay bricks, between which are layers of reeds. It had a base some 30 feet square at the bottom, and 15 feet at the top. The entrance must have been by ladder, or, as is still seen on the watch-towers in north-west Kan-su, by a very slender stairway up one wall outside. This stairway is also of brick, but can be destroyed in a few minutes once the defenders have mounted.

Five miles to the north of the lagoon the spurs of the nearest Kuruk Tagh can be seen. During the following day, having crossed an undulating wind-swept plateau covered with fine gravel, we dropped as usual into a depression, in which has been and now is at times a lagoon. At the south-east end we came upon the ruins of an ancient fortified post (or kurgan). The walls are built of small clay or mud bricks, and are still 14 to 16 feet thick. It had two entrances, one to the west, another to the north, and was roofless. The walls were 20 to 25 feet high, and were once probably higher. The post is of wonderful solidity, and in its day must have been impregnable.

Later on the same day another kurgan was discovered, but this was of larger dimensions, and probably held a permanent garrison. The remains of the double walls are 80 yards long by 50 wide outside, the inner walls being some 30 feet above ground-level. The site overlooks a wide-spreading lagoon 8 to 10 miles in extent, the bed of which held little water, being filled with reed-jungle and clay mounds.

For the last few days in the desert our route lay over the same kind of country as that already described. Even right up to the border of the oasis surrounding Sachu vegetation is exceedingly scanty, and the first sight of trees, luxuriant to us after the last month, was a real treat. Sachu is an ancient Chinese settlement said to have been planted as an outpost against the marauding Hung nu, or Huns (?), as early as the first century A.D. It was originally called Tung Huang, and is at present known locally by no other name.

From Sachu to the Great Wall at Chia-yu-kuan, the ancient frontier of China, took us twelve days to march. Here the final portion of the journey commenced—that through China proper. Though still three months from our destination, we were for the first time for six months in touch with civilization in the shape of the telegraph. From here to Lan Chou, the capital of Kan-su, the main great north-west road from Peking to Kashgar was traversed. The country, though sparsely settled, is of considerable value, being well adapted for pastoral use. Unfortunately, the Chinese are not a pastoral people, being essentially agricultural, so that it is unlikely that any large immigration will take place.

The mineral value of this portion of China is considerable, and I venture to prophesy that in the not far distant future it will make a name for itself as one of the richest coal and oil districts in the country. At present its future exploitation, from the point of view both of trade and mineral wealth, depends entirely upon the construction of a railway.

This strip of north-west Kan-su is, in its physical aspect, a continuation of the series of oases which border the desert along the northern base of the Kuen Lun range in Chinese Turkestan. Its streams, such as they are, partake of the same character as those already described in the latter country, that is to say, they are snow fed from the Nan Shan range and its offshoots, and are of variable volume, with a short course which ends in absorption in the desert to the north, or they are merged in the waters of the only two rivers deserving that name, the Hei Ho and the Yellow river. The main watershed dividing these two streams is formed by the Wu-shi Ling, a pass just under 10,000 feet in height, which presents no serious difficulty even to wheel traffic.

On the southern side of the Wu-shi Ling, a marked difference is to be seen in the agricultural wealth of the country. From the Wu-shi Ling to Lan Chou, in a minor degree, are found all the characteristics common to the more settled provinces of China. Here the population per square mile at once begins to increase. Villages are more thickly planted, and the general aspect is one of agricultural comfort.

From Lan Chou to Tai-yuan Fu, in Shan-si, our route lay through a little-known part of China. We crossed Eastern Kan-su Shen-si an Shan-si provinces, between the 36th and 38th parallels of latitude, visiting villages and old towns where Europeans had in some cases never before been seen. The area traversed consists of a series of plateaux in the heart of the loess country of North China, whose average height above sea-level is nearly 4000 feet. As is well known, the loess country is a most fertile soil, but more than any requires water, and that without fail. The districts traversed, though thinly populated, support a larger population than is usually supposed, and afforded a surprise in the character of the country, such as must be seen to be believed.

A study of the loess formation of Northern China would afford sufficient matter for more than one paper such as this, and it is only referred to to-night in the hope of invoking some information upon what appeared to us a matter for surprise, nowhere having previously seen any reference to such an extraordinary change in the character of the loess soil. The arid aspect and monotonous lack of natural vegetation common to all such districts is well known. Traversing the intricate network of valleys and stream gorges, between which are the plateaux characteristic of this part of Northern China, we had reached the border-line between Kan-su and Shen-si.

Beyond the town of Ching-yang Fu we were suddenly surprised, in the course of the day's march, to notice the valley-sides and hills were

becoming covered with brushwood. As we ascended the valley up a small tributary of the Huan Ho, trees, grass, and undergrowth increased, and the face of the country began to change as though by magic. The stream had become so choked with brushwood as to be almost impenetrable, and though the effect was somewhat sombre owing to the foliage not yet being out, the relief to the senses after the unvarying drab-coloured hill-sides and terraces was most pleasing. Towards midday we had mounted some few hundred feet up a spur on to a main ridge, and from there the view to us seemed a fairy transformation. Impossible as it may sound, but for the lack of grass, it was easy to imagine one's self riding over the Surrey hills. A series of ridges and spurs divided by numerous small valleys lay before us, all heavily clothed with trees and thickets of thorn and other scrub. As far as could be seen around, the whole district appeared similar, and it was easy enough to believe now the stories we had heard a few days previously at a tiny Catholic mission station buried in these wilds, of boar, deer, panther, pheasants, and game of all kinds. The existence of this mission was quite unknown to us, and it was by accident only that we did not pass without seeing it. Riding ahead of the caravan through the ruins of what had once been a picturesque village, Ma-Lin by name, I had paused to admire one of the lonely stone memorial arches so common in China. In addition to a low balustrade, the front of the arch pillars was faced with polished black stone, upon which was graven deep Chinese characters. From the tops of the fretted grey stonework hung small bronze bells, which the gentlest breeze sufficed to set tinkling.

Previous to entering the village we had passed the remains of a picturesque old temple, and no doubt the latter, as well as the archway, were both part of the same story could we have learnt it. Inquiry, however, as was usually the case, proved fruitless. In China, those able to do so are never anxious to tell the story.

As I was about to move on, my eye caught sight of a Chinese farm hand, and on looking at him again I was astonished to see in his mouth a distinctly European pipe. At the same moment I noticed, over the doorway of one of the courtyards, a small cross. The mystery of the pipe was soon explained. In answer to my question, the owner of it led the way into the yard, on the other side of which stood a tiny chapel, from whence, as we entered, one of the two brothers in charge was just emerging. Mutual introduction followed, and we were soon enjoying the limited but unstinted hospitality the little mission afforded. Buried in the wilds of Kan-su, this has been established for fifteen years. So far as the two brothers were aware, it had only twice before been visited by strangers. In one case the traveller was the well-known mission leader, Dr. Martin; in the other it was the Russian explorer Obrutchev.

Thanks to the artistic powers of a former brother, the mission possesses a perfect gem in its miniature chapel. Inside it is profusely ornamented with scroll paintings of no mean merit, and these, with the carved woodwork in which Chinese carpenters excel, and some imported lanterns, give to its interior an aspect of tender care wholly in keeping with the character of the devoted men who are content to spend their lives cut off from civilization.

After bidding farewell to our hosts, we crossed into Shen-si province, and made our way over one watershed after another by hill tracks until we struck the valley of the Lo Ho at Fu Chou. Up this we turned to Yen-an Fu. A curious feature of this district is the cave tombs to be seen here and there cut in the solid rock. That they are or were temples I believe to be the case, though I am aware that during the terrible days of the great Mohammedan rebellion many caves were used as hiding-places by the wretched inhabitants.

From the solidity of the work, and in one case from a curious kind of sarcophagus which we saw in a temple, I am led to suppose that they are Buddhist remains. That Buddhism still flourishes is shown by the temples in daily use. Most picturesque some of these are, and I was fortunate to be the witness of a quaint scene at one of these lonely spots. A little temple stood perched on a rocky bluff some 40 feet above a small stream having at its back a steep thickly wooded hillside. As I rode past on the narrow winding track, a respectably dressed farmer had just arrived, either to return thanks for some favour or to ask a boon from the little gilt figure of Buddha, which sat enshrined in the usual attitude. Having dismounted, the farmer produced from his saddle-bags six large dough-cakes, an offering which visibly caused the mouth of the old priest to water, and as the latter, an old man, kept solemn time beating a small brass incense-pot with a tiny mallet, the farmer made his prayers and his adoration on his knees. Holding in one hand a lighted fire-stick, he lit two small pieces of tissue-paper which lay in his right palm, then gently allowed the burnt ashes to float away. Rising from his knees, he turned to me as I sat outside on my mule, and politely asked if the noise of crackers would frighten the animal, at the same time holding up a joss-packet which he took from a table by the door. As the mule was standing on the very edge of the bluff above the stream, I replied that probably it would, so he quietly bade me depart, and I went, but for the rest of the day I could not shake from my mind the idea that in the simple ceremony just witnessed perhaps the key was to be found for the regeneration of this vast empire, which before everything requires a firm and honest belief in some moral faith.

Near Yen-an Fu the first signs are met with of the vicinity of the huge coalfields which cover Shan-si and stretch well into Shen-si. Petroleum is also found 30 miles from the town. Yen-an Fu, like Ching-yang, is merely a skeleton of what it once has been. Ichabod is written

large over all these towns, which have never rallied from the years of continuous warfare which the first Mohammedan rebellion inaugurated. It stands on a small tributary of the Yellow river, the Fu Ho. None of these streams are navigable, not even the Lo Ho, which we had crossed at Fu Chou, although at certain seasons the water is deep enough to allow of the passage of the flat-bottomed ferry-boats in use on the Yellow river. Most of the streams are too winding and the mud-banks and shallows too frequent to make it worth while to attempt navigation.

Leaving Yen-an Fu, we struck north-east across a local watershed to Yen Chuan, a small town standing on the Hsia Ho, a tributary of the Yellow river. The approach to the latter is through a most intricate network of small ravines and rocky gorges, though still the general character of the country is loess. At the point we crossed the river by a ferry is the tiny village of Yen-shui-kuan. The left bank has a precipitous cliff of rock 180 to 200 feet high, the right being much lower, and from it broken low hills run back, under which the village nestles at the water's edge. The river is 300 yards wide and flat bottomed; plank-built boats carry on the local traffic down-stream.

The western half of Shan-si province is similar to the Shen-si country, that is loess, but with the unusual red-coloured formation occasionally showing up. This is said by Richthofen to occur where the loess lies in greatest thickness, its lowest portions then being of a reddish colour. Once across the Yellow river, the traveller finds himself gradually approaching a veritable black country, where coal, and coal alone, occupies the lives of three-quarters of the population.

Historically, Shan-si province may be said to represent the home of the Chinese race. As early as B.C. 2255, the people of Meaou, who were the inhabitants of what is now called Shan-si, are mentioned in the Chinese classics as being in a state of rebellion. From the same source, we know that the Yae-Yuan plain mentioned as being "set in order" after a great flood (probably the flood referred to in the Christian Bible) is that portion of the present Fen Ho valley between Fen Chou and Ping-Yang in Shan-si.

At Fen Chou the main highway from Sian Fu to Tai-yuan Fu was reached. The town lies at the north-west end of the Huo Shan, a high range which is the dividing-line between the anthracite districts of Eastern Shan-si and the bithuminous portion of the province lying mainly to the west of the mountains.

Tai-yuan Fu, the capital of the province, lies on the left bank of the Fen Ho, and is chiefly known to ill fame as being the scene of the most cold-blooded and brutal murders of European missionaries in 1900. Between Tai-yuan Fu and Cheng-ting Fu, the latter a station on the Lu-Han railway which connects Peking with Hankow, some of the richest coal and iron districts in the province are to be found; anthracite coal of the very best kind is mined in unlimited

quantities, and the strings of donkeys, each laden with two enormous lumps of coal, are a feature on the abominable track over which most of the trade into Shan-si still runs. That this historic route will soon become a thing of the past is probable, for a small branch line has even now penetrated halfway to Tai-yuan Fu, which Belgian interest is responsible for. It is hoped that the capital of Shan-si will be reached in another eighteen months.

Finding the railhead at the small town of Ching Hsing, just inside the border of Chili province, we gladly exchanged our nine months of methodical daily tramp for the speedier and more modern method, and in forty-eight hours found ourselves in Peking.

Before the paper, the PRESIDENT: I have to introduce to you Major C. D. Bruce, who is addressing our Society for the first time to-night. I shall not, of course, say anything about his last interesting and, to a large extent, novel journey through Asia from Leh to Peking, because his paper will speak for itself, but I will say a few words as to his previous career in the Far East, which made preparation for that journey. Major Bruce went out originally to Wai-hei-wai as second in command under Colonel Bower—who is here to-night, and I hope will speak later of that Wai-hei-wai regiment of which we used to hear so much, but which no longer exists. In 1900 he went with the regiment on the Peking expedition, and was severely wounded in the attack on Tien-tsing. Since that time he has been travelling largely in Asia. I need not give you the details; but it will interest you to know you are not listening to a neophyte in the ways of the East. I now call upon Major Bruce to give us his paper.

After the paper—

Sir THOMAS HOLDICH: Major Bruce has taken us into a part of the Eastern world with which personally, I regret infinitely to say, I am unacquainted; consequently, I am able to offer but little criticism on the admirable paper he has just read to us. I have just a word or two about the loess formation to which he has alluded, which may be interesting. So far as I know, where I have travelled in Central Asian districts, loess formation is to be found on the northern slopes of all the principal ranges running east and west throughout the country, and I have long ago come to the conclusion that the formation is due partly to wind action (especially to the extraordinarily forcible north-western winds which obtain all through high Asia), and partly to detritus washed down from the hills during the season of flood. That undoubtedly is the condition of the loess which we find on the northern slopes of the Turkestan ranges, and although I am quite unacquainted with the part of Asia which Major Bruce has been describing, I cannot help thinking that the same great forces of Nature produce the same formations which he has encountered. There is, however, another point to which Major Bruce has made allusion to which I should like to call your attention. He has recognized, in a most generous way, the admirable assistance obtained from one of the native surveyors, who was attached to his party from the Survey of India. Now this, I am glad to say, is nothing new, for I think every explorer who has been assisted by these surveyors lately has invariably borne the same evidence to the excellence of their work. But at this time it is with new interest that we regard this matter, for we are approaching a new phase of geographical exploration. The old age of pioneer work has passed away, and we must now, when we set to work to wander through new countries (as Major Bruce has done), make use of more or less trained

agency to assist our observations as simple travellers. With the enormous field that still lies before us in various parts of the world, I conceive that we shall never arrive at the solution of the great problem of mapping the world successfully without some such agency as this. Well, it happens that the Colonial Committee have lately issued a Report on Surveys in another part of the world, *i.e.* in British Africa. It is a most admirable report, and will be, I am certain, of immense interest to all those of you who are interested in that country. In that report they have described the success which has, so far, attended efforts to train the natives of Africa as the natives of India have been trained in Survey duties. Taking it on the whole, I regret to say that the reports are not altogether favourable. With the single exception of Lagos, I do not think there is any one report which might lead one to hope that in future great success will attend these efforts; but I would like to warn those who are interested in the matter, that it is far too soon to arrive at any conclusion on the subject. If you will for an instant consider what the process is by which men, such as those to whom Major Bruce has alluded, arrive at the skill which they attain as surveyors, you will, I think, agree with me that it is a long process, and a laborious process, to attain such an amount of technical knowledge as they acquire. In the first place, in India, the men whom we get for this duty are drafted from all sources, both civil and military; and you must remember that from the very beginning they are well-educated men. We do not deal with quite such raw material as they find in Africa. The African schools have not yet arrived at the position of turning out men whose education you may consider as thoroughly sound when they are selected for survey training. In India, having got the men specially selected, in the first instance, they are again subjected to a process which we might call a process of natural selection, until finally, after some years' experience, they are drafted into the Survey Department for a further five or six years' severe training before they can take the field for such work as Major Bruce has described. All this, as you will easily recognize, is a matter of time and patience and infinite trouble; but I have every conviction myself that they will eventually find in Africa men quite equal in intelligence to any that we find in Asiatic fields; and I firmly believe that if they are to solve the gigantic problem of mapping the continent of Africa rapidly and cheaply, it will be through native agency; but only after the application of infinite toil and patience in training shall we succeed in getting the men we want.

Colonel Bower: Major Bruce has modestly talked of himself as an unscientific explorer. I do not think it is possible for any man to visit Chinese Turkestan and leave it without certain feelings of lost opportunity. My own feelings, when I was there, were that one day I wished I had been a geologist; another day, a linguist; another day, a naturalist; another day, a botanist, and so on. No one man can come away able to do more than simply give a good general description of what he has seen, as Major Bruce has done this evening. I agree with Sir Thomas Holdich that it is now the time for specialists.

I have heard the theory advanced that the population of the world has not so much increased, but that centres of population have changed. If there is anything at all in that argument, the strongest point in its favour is the existence of Chinese Turkestan, where you have a country nearly all desert, with an oasis here and there, yet under that desert we know there are the remains of innumerable towns and villages; and then away to the north there are also cities under the ground; hills with tunnels, and in those tunnels rooms and houses. Obviously they were occupied by a different people from those who lived in houses in the plain now buried under the sand. We have every proof there were many races and many languages there—we find traces of them. It is a great field for scientific research.

Major Bruce alluded to the water-channels changing their course. Undoubtedly they do; and, what is more, I think there are subterranean channels there that also change their courses. On the north of the Tarim river, I was travelling through a forest of tagrak trees (poplar), when suddenly I stepped out from living into dead trees, and the whole day marched through dead trees with every twig perfect. It is a very difficult thing to account for; apparently they were all struck dead on the same day. The only thing I can think of is that they were nourished by some underground water that had suddenly changed its course. Major Bruce mentioned the lakes that had different levels, and were apparently shrinking. My experience in Tibet was that nearly every lake showed obvious signs of at one time having been very much larger.

Captain Deasy: The paper which has just been read to us by Major Bruce is of special interest to me, because I have made three expeditions into Tibet and into the adjoining country, and I would like to remind you of several problems which still remain unsolved. One of these is the course of the 'Khotan river from the source down through the Kuen Lun range, considerably to the west of where Major Bruce went. Another, of a different nature, and one to which Major Bruce has alluded, is the problem of the origin of the gold-supply of Central Asia. There is, undoubtedly, a good deal of gold to be found there. It has been of special interest to me to hear that Major Bruce has found another route from the south of the Kuen Lun range into Polu. It bears out, I think, the statement which has been made by a good many travellers, that there is no caravan route either from Rudok or Lhasa into Polu and Chinese Turkestan. I have been constantly told that in days gone by there was a regular trade route from Lhasa into Polu, and I made every endeavour to try and verify that statement, but without success. We cannot regard that route by which Major Bruce went to Polu as a trade route. He has alluded in a very brief manner to the difficulties of the journey, and glossed them over in the course of a few words. But I can assure you that the difficulties which he has had to encounter, especially in that part, have been exceedingly severe; indeed, far harder than you would think from listening to Major Bruce this evening. I am very glad to have heard the remarks which Sir Thomas Holdich has made concerning the assistance which I think nearly every British traveller in Central Asia has had from the Survey Department of India. Subsurveyors, all of whom are highly trained, are always ready to volunteer to accompany any British officer, or any Britisher, into no matter what parts of Central Asia. When the history of the exploration of Central Asia comes to be written, I sincerely hope we shall find adequate credit given to the Indian Government, and more especially the Survey Department of India, for all the valuable help and assistance they have given to geographical research and science in Central Asia.

Captain Neill Malcolm: I am afraid I can add very little to what we have heard this evening, because the route which I took with the late Captain Wellby, whose name will be remembered by many Fellows of this Society, differed a great deal from that of Major Bruce, because, although we started from Leh and went to Peking, we only touched his route at the Lanak La and at Lan Chou, but I can corroborate what he has told you about the solitude of Tibet and the sense of the insignificance of man, since for four and a half months we did not come across a dwelling of any kind. You can thus see that I can add but little to your knowledge of the part of the world Major Bruce has described this evening. The only thing I should like to talk about is the question of native surveyors to whom Sir Thomas Holdich has alluded, and the possibility of our using them in Africa. I, like every other traveller in Central Asia, owe much to the native surveyors of

India; and if we are going to do anything of the kind in Africa, the people to whom we might turn for help are, I think, the Baganda. The ordinary native of Africa has a glorious indifference to detail at any time. He cannot understand that it matters whether you call a lake by the same name as a mountain, or a mountain by the same name as a lake. But with the Baganda it is rather different, for they are naturally intelligent, and appreciate anything in the nature of book learning. As far as I know, they are the only people of Africa who do so, and if there is going to be a survey department, they are the people with whom we might possibly begin.

After some remarks by Captain TURNER—

The PRESIDENT: I must for once depart from my usual reticence in the chair and criticize one part of the discussion—Captain Malcolm's statement about the Baganda. He used the phrase that they were the only African race who loved a book. Now, oddly enough, that was the very phrase that H. M. Stanley, who knew the Baganda well, used years ago in speaking of the Hausas. I cannot allow the credit of my beloved Hausas to be taken away as the only African people who, for many centuries, have produced books—history, romance, poetry. Now I have to ask you to give a hearty vote of thanks to Major Bruce for his very able paper.

Major BRUCE: I have to thank you very much indeed for the kind attention you have given to my paper to-night, also those gentlemen who have been good enough to offer the few but very interesting remarks they did—Sir Thomas Holdich, Colonel Bower, Captain Deasy, and Captain Malcolm. I do not wish to detain you any further. I have only to thank you once more for your very kind attention to me.

A SHORT ACCOUNT OF THE RUSSIAN HYDROGRAPHICAL SURVEY.

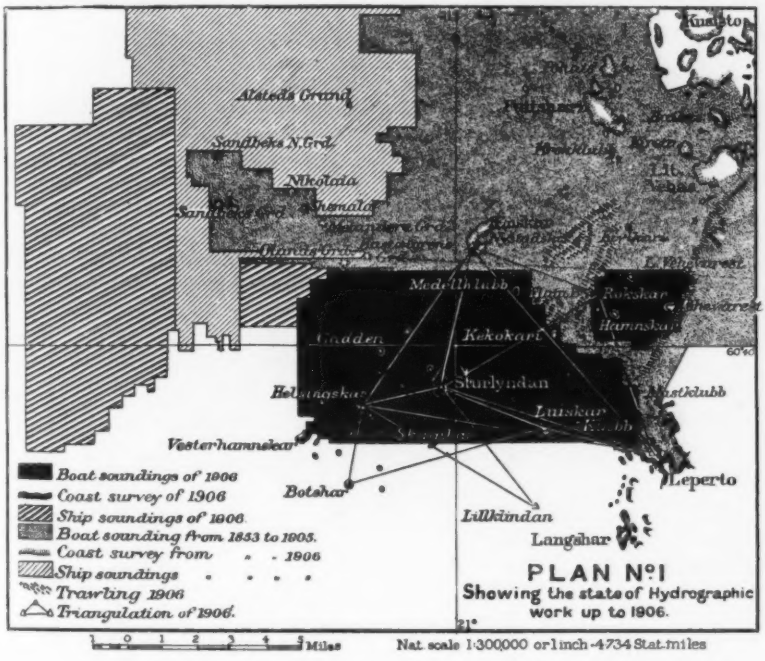
By J. de SCHOKALSKY, Colonel of the I.R.N., Hon. Corr. Member of the R.G.S., President of the Section of Physical Geography of the Imperial Russian Geographical Society, St. Petersburg.

THE beginning of the Hydrographical Survey in Russia was contemporaneous with the greatest change in the destiny of the Empire, the time of Peter the Great. This Tzar, the first who assumed the title of Emperor, ordered various hydrographical work to be done, necessary in connection with the navy, the foundation of which is also one of his glories.

At first the administration of the hydrographical survey depended solely on the Tzar. He himself chose from the officers men suitable to undertake this work, and indicated where the surveys should be made. In 1724 the Tzar ordered the Admiralty Board to give instructions, drawn up by this administrative body, to the officers charged with the survey of the Gulf of Finland. Later this practice became the rule, and the direction of the hydrographical survey was made the duty of this board.

The first chief hydrographer was A. Nagaef, captain in the navy, who, by the order of the board, had made a study of hydrographical

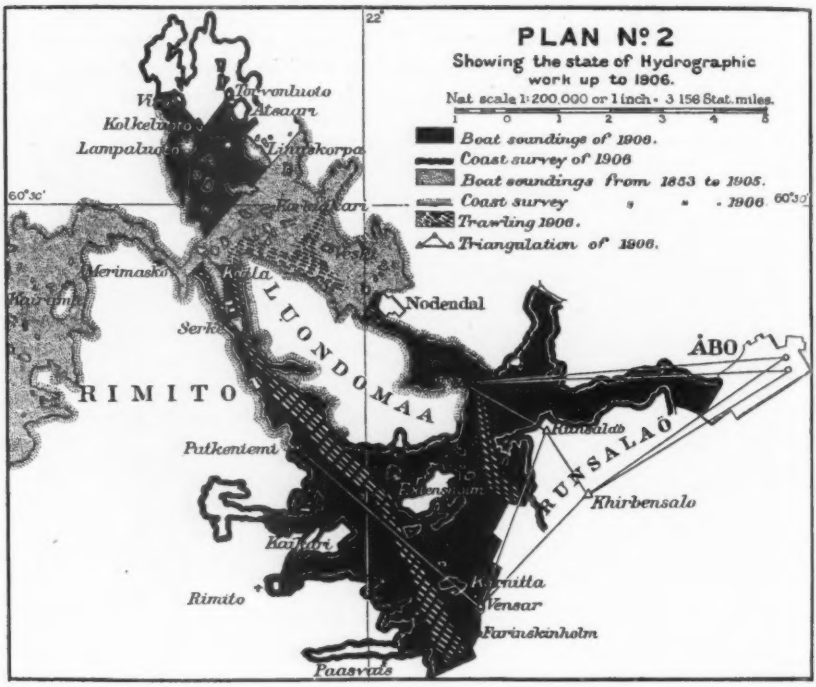
surveying. The first naval charts were printed in the naval press, which belonged in the year 1752 to the Naval Academy, and afterwards to the Naval School. Under the Emperor Paul I., it was constituted a Committee for the extension of naval science and for the improvement of naval practice, under which was included hydrography; but this committee existed only till the year 1805, when the Imperial Admiralty Board was founded (Gosudarstvennui Admiralteiski Department) under the direction of the Minister of the Navy. The purpose of this



board was to ensure that the hydrography of Russian waters should be as perfect as contemporary knowledge could make it. In January, 1824, this board was abolished, and in its place was established the Administration of the Chief Hydrographer and the Committee of Naval Science, the former being only occupied with hydrographical work.

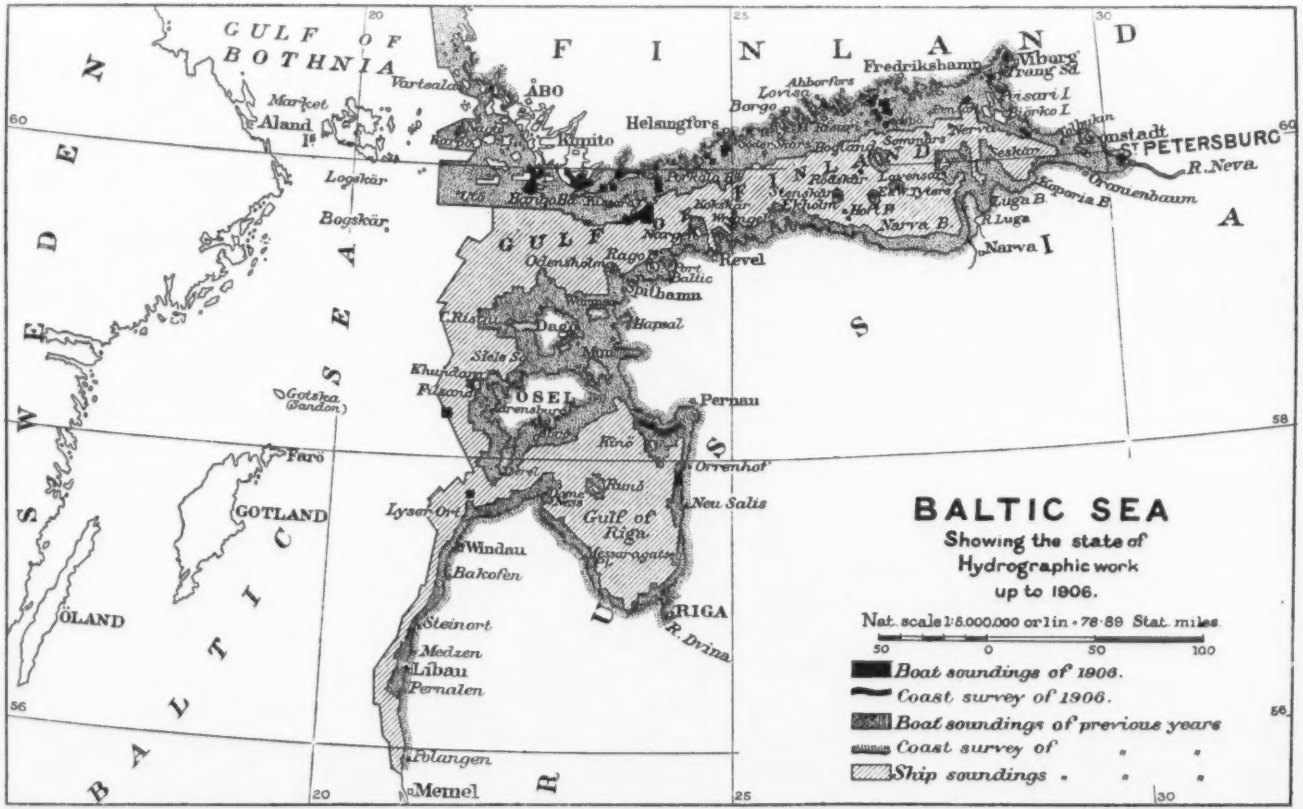
The first and only chief of the administration was Admiral Saruchef, and his *aide* was Lieut.-General Schubert. After the death of Saruchef the administration was carried on by a Hydrographical Department, which twenty years ago was named (in 1884) General Administration of Hydrography.

After the preceding short account of changes in hydrographical administration in Russia, we can now consider our principal theme—the hydrography of Russian waters.



OLD PERIOD, TO 1855.

Baltic Sea.—Before Peter the Great, "geographical drawings" so called, without meridians and parallels, were used in Russia in place of geographical charts. Evidently, therefore, the Russian navy at first used foreign naval charts. The first Russian charts of the Baltic sea were made at the end of the eighteenth century, and the first atlas of this sea is dated 1738; it was made by a naval officer, Soimonof. The second "atlas" was the work of the hydrographer Nagaef, and was published in 1757; this atlas was used for fifty years. The first really scientific hydrography began at the commencement of the nineteenth century, when the direction of the hydrographical survey was in the hands of General Schubert. He made the first triangulation of the Baltic sea, by which was ascertained the position (1828–1838) of 648 points on its shores, and in 1832 the chronometrical expedition was

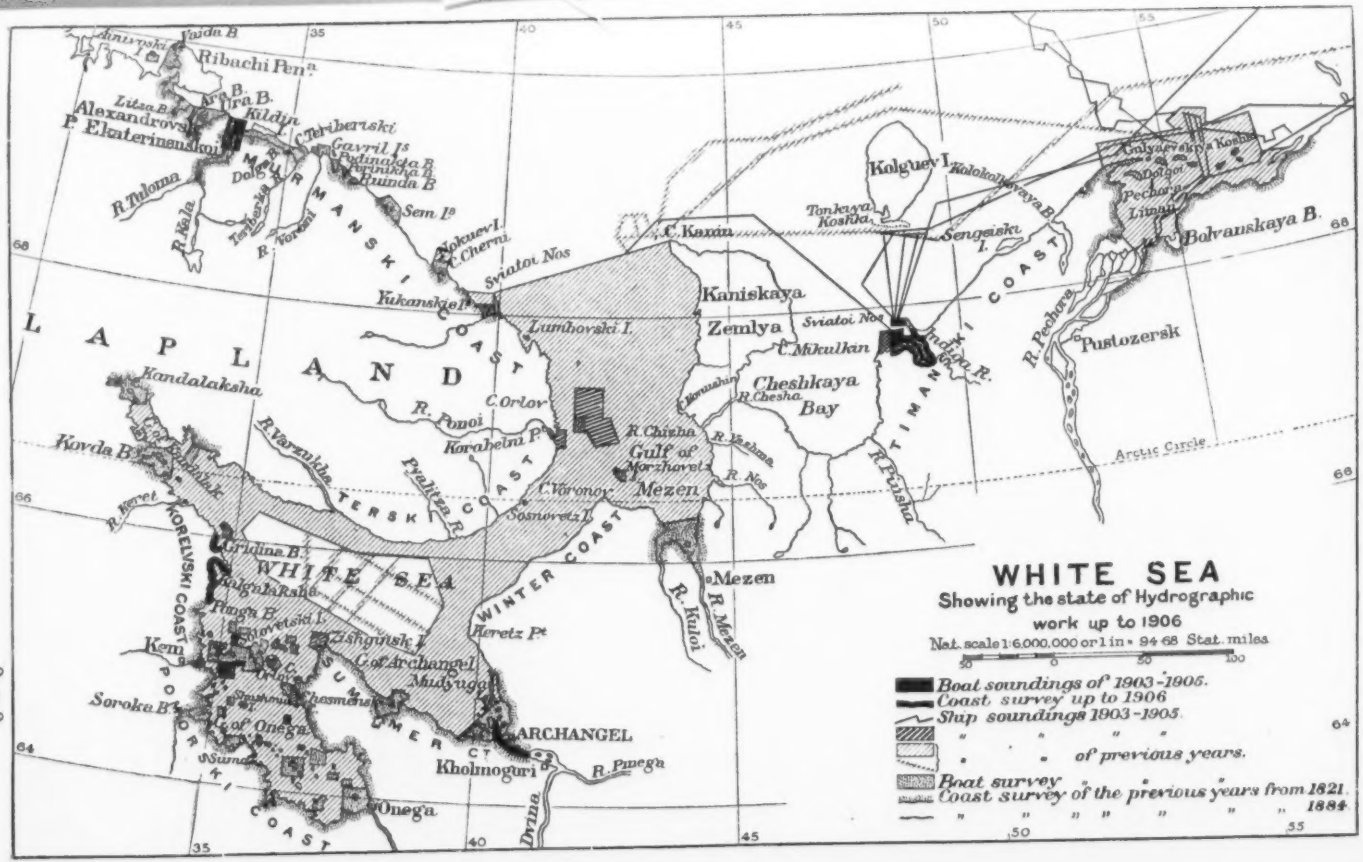

GULF OF BOTHNIA
FINLAND
SWEDEN
BALTIC SEA
GULF OF FINLAND
ÅBO
Vartsala
Market
Aland Is.
Kumito
Helsingfors
Fredrikshamn
Viborg
Loviisa
Borgo
Abborfors
Nyslott
ST PETERSBURG
R. Neva
Oranienbaum
Koporia B.
Luga B.
R. Luga
Narva B.
Narva
Revel
Rago B.
Odenshalm
Pilhamn
Dagö
Hapsal
Khuidoma
Filsand
ÖSEL
Pernau
Gotska Sandön
Faro
GOTLAND
ÖLAND
Lysen Ort
Windau
Bakofen
Steinort
Medzen
Libau
Pernalen
Polangen
Memel
Gulf of Riga
Orrenhof
Neu Salis
RIGA
R. Dvina
Logeskär
Bogskär
Ristna
Sworbe
Kunö
Moon
Hiiumaa
Sarema
Abro Kar
Stenshär
Ekholm
Lavensari
Rönskär
Björko I.
Tytärsari I.
Seskär
Sommars
Boglandet
Kalbådan
Sommers
Nervo
Ainaste
Porkala Ud
Hangö Bl.
Tvärminne
Ruskeala
Ekenäs
Hangö
Nargen
Worms
Ristna
Sworbe
Kunö
Moon
Hiiumaa
Sarema
Abro Kar
Stenshär
Ekholm
Lavensari
Rönskär
Björko I.
Tytärsari I.
Seskär
Sommars
Boglandet
Kalbådan
Sommers
Nervo
Ainaste
Porkala Ud
Hangö Bl.
Tvärminne
Ruskeala
Ekenäs
Hangö
Nargen
Worms
20
25
30
60
58
56
BALTIC SEA
Showing the state of Hydrographic work up to 1906.
Nat. scale 1:5,000,000 or 1 in. = 78·89 Stat. miles.
50 0 50 100
Boat soundings of 1906.
Coast survey of 1906.
Boat soundings of previous years
Coast survey of " "
Ship soundings " " "

despatched with the duty of fixing the longitude of 72 points. Plane-table work was based on these determinations to a scale of 1200 feet to the inch, and many soundings were taken. By the beginning of the year 1855, 42,285 square versts of the Baltic had been surveyed.

White Sea.—The first survey in the White sea began after the death of Peter the Great. From 1727 to 1739 several naval officers surveyed some of its shores, the mouth of the Dvina, and the shores from Point Kanin to the Obdorsk, and further east. But all this survey, except the survey eastward from Cape Kanin, was made without any system, and the hydrography of the White sea remained very imperfect till the year 1797, when Major-General Golenischtef-Koutusof impressed upon the Admiralty Board the necessity of a general survey of that sea. This project was approved, the survey was carried on from 1798 to 1801, and the results published in 1806 in an 'Atlas of the White sea.' Many imperfections in this first work necessitated a re-survey of this basin, and the work was placed in the hands of Captain-Lieut. Reinecke in 1827. This hydrographical expedition was based on a true scientific system, and continued till 1832. The results were published in 1835 in an 'Atlas of Charts of the White Sea,' followed by a 'Directory' of the same sea and all the northern shores of Russia in Europe.

Siberia.—The shores of Siberia were surveyed firstly by the Great Northern Expedition, which was in operation from 1734 to 1741, and surveyed a long line of coast from Cape Kanin to the mouth of the Koluma river. The work of this famous expedition was described by me in the Notice presented to the Eighth International Geographical Congress in London in 1895. From 1821 to 1853 many parts of the northern shores of Russia were resurveyed. The shores eastward of the White sea were resurveyed in 1826–28 by two expeditions sent by the Admiralty. The first consisted of two pilot officers, Mr. Pakhtussof and Berejnuikh. It started from Pustosersk, at the mouth of the Pechora, and surveyed all the shores from the islands in the delta of the Pechora to Kanin, taking soundings all the way.

The second expedition worked two years consecutively. Its leaders were two pilot officers, Ivanov and Ragozin. It also started from Pustosersk in the spring of 1826 towards Medinski Zavorot, in the Pechora delta, as this delta had already been surveyed in 1821–24 by the pilot officer Ivanov. After a survey of the isles lying near the shores of the delta, the bay of Khaipuduir, and the coast up to the southern part of the Kara sea, the expedition returned to Obdorsk to winter. In the spring of the next year the expedition started from Obdorsk towards the mouth of the river Baidarata, and from there it surveyed all the shores round the Yalmal peninsula. Along these shores the expedition determined the latitude of sixty-one places, the longitude of thirty-three, and the magnetic variation of many. Tidal observations were also recorded.


WHITE SEA
Showing the state of Hydrographic work up to 1906
Nat. scale 1:6,000,000 or 1 in = 94·68 Stat. miles
50 0 50 100
Boat soundings of 1903-1905.
Coast survey up to 1906
Ship soundings 1903-1905.
" " " " of previous years.
Boat survey
Coast survey of the previous years from 1821 1884
" " " " " " " "
LAPLAND
KANDALAKSHA COAST
TERSKI COAST
KORELVSKI COAST
PORJA COAST
MANSKI COAST
WINTER COAST
TIMANSKI COAST
SUMMER COAST
Kandalaksha
Kovda B.
Gridina B.
Kem
Soroka B.
Onega
Kholmogori
ARCHANGEL
Mudyuga
C. of Archangel
Zishginski I.
Morzhovetski I.
Ranga B.
Kuzova Rabo
Sosnovetz I.
C. Voronov
Gulf of Morzhovetz
Mezen
R. Mezen
R. Kuloi
Haretz Pt
C. Orlov
Korabelna Pt
R. Ponoi
Lumbovski I.
Kaniskaya Zemlya
Sviatoi Nos
C. Mikulkin
Cheshkaya Bay
R. Chesha
R. Izhma
R. Nos
R. Pustaya
Indiga R.
C. Kanin
Kolguev I.
Kolokolkovaya B.
Tonkaya Koshka
Sengeiski I.
Kanin Nos
Pustozersk
R. Pechora
Bolvanskaya B.
Arctic Circle
Ribachi Pen.
Alexandrovsk
P. Ekaterinenskoi
Kildin
Gavril Is.
Sem Is.
Yukanskoi
Zhuzhemski I.
Vaida B.
Litza B.
Dolgaya R.
R. Tuloma
R. Kola
Tetrina R.
Norvasi
Padinakska B.
Pavanicha B.
Hunda B.
Yokuev I.
C. Chernu
Sviatoi Nos
C. Zhuzhemski
R. Varzuga
R. Varet
Pralitza R.
R. Chirka
Gulf of Morzhovetz
Kolguev I.
Kolokolkovaya B.
Tonkaya Koshka
Sengeiski I.
Kanin Nos
Kaniskaya Zemlya
Sviatoi Nos
C. Mikulkan
Indiga R.
Cheshkaya Bay
R. Chesha
R. Izhma
R. Nos
R. Pustaya
Pustozersk
R. Pechora
Bolvanskaya B.
Arctic Circle
Dolgoi
Pechora
Litzkii
Kolguev I.
Kolokolkovaya B.
Tonkaya Koshka
Sengeiski I.
Kanin Nos
Kaniskaya Zemlya
Sviatoi Nos
C. Mikulkan
Indiga R.
Cheshkaya Bay
R. Chesha
R. Izhma
R. Nos
R. Pustaya
Pustozersk
R. Pechora
Bolvanskaya B.
Arctic Circle
Dolgoi
Pechora
Litzkii

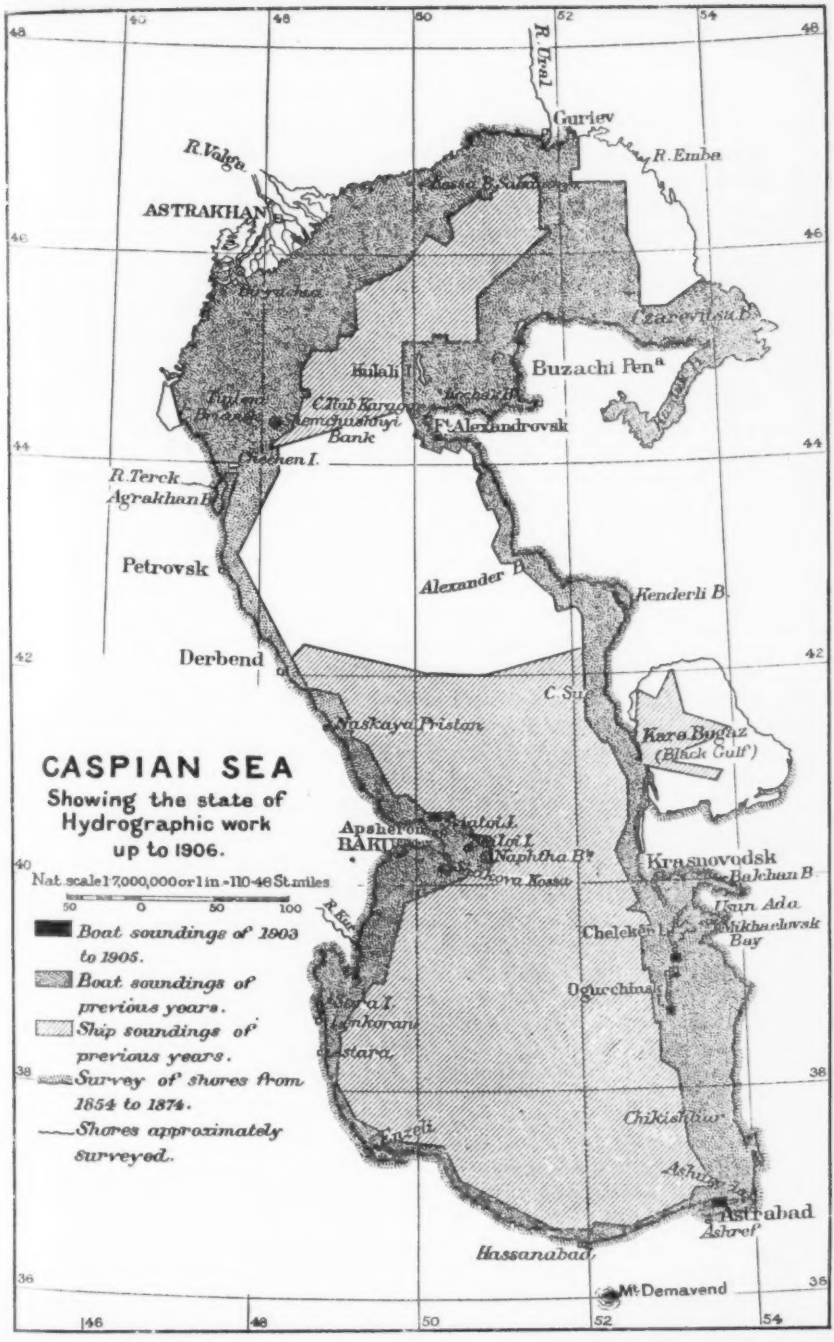
Novaya Zemlya.—The Russian expeditions for the exploration of Novaya Zemlya began in 1768. The first explorer was navigating-officer Rosmuislof, who surveyed some parts of the eastern shores and the Matochkin Shar. From 1821 to 1824, Captain-Lieut. Lutke, T.R.N., surveyed all the west shores and the channel of Matochkin Shar. In 1832–34, navigating-officers Paktusoff and Zivolka surveyed the eastern shores to 75° N. lat., and in 1838–39 navigating-officers Moiesseef and Rogatshof surveyed some parts of the western shores. Of late years many surveys have been made in different parts of these islands, with the idea of discovering harbours for ships approaching their shores, but no systematic survey has been organized.

Azov Sea.—The first charts of this sea were published under Peter the Great (when the Azov fleet was started); the first hydrographical work was an atlas of the river Don from Voronej to the Azov sea; the survey was made by Admiral Kruys, and published in Amsterdam in 1703-04 in Russian and Dutch. The hydrographical survey closely followed the extension of Russian authority over the shores of the Azov sea, in the year 1701 an atlas of the eastern part of the sea was published, and in the next year it was possible to construct a chart of the whole sea. This chart was re-edited by the new survey in 1771, and from that time to the year 1835 many other charts were published, showing different parts of the shores of this basin.

Black Sea.—The first Russian hydrographical work in the Black sea began with the voyage of the Russian man-of-war *Krepost*, with the ambassador Oukraintzef, from Kerch to Stamboul. But although many hydrographical surveys were made in different places of the Black sea in the course of the eighteenth century, till the reign of Catherine II. the chart in greatest use was a French one of the Black and Azov seas, published in Paris in the year 1772. In the second part of the eighteenth century began the more serious hydrographical surveys of this basin, and some of the results were published in 1779 by Captain Billings, an hydrographer of the first rank. The atlas contains the charts of the shores of the Black sea from the mouth of the Dniester to the Kuban.

In 1807 was published another atlas of the western shores of the Black sea, constructed by Lieut. Boudishtchef. But finer and more competent work was carried out by Captain Manganari from 1825–1836; he surveyed both the Azov and the Black seas, and collected all his work in an atlas published in the year 1842. Up to the year 1855 a great part of the basin of the Black and Azov seas was surveyed and sounded.

The Caspian Sea.—The hydrographical work in this basin also began under Peter the Great. The first map of this sea was produced by order of the Tzar Aleksei Mikhailovich, about 1660, by a Danish gentleman, Shatran, on the basis of his own work and various other surveys, but we know very little about them. The first serious


CASPIAN SEA
Showing the state of Hydrographic work up to 1906.
Nat. scale 1:7,000,000 or 1 in = 110·46 St. miles
50 0 50 100
Boat soundings of 1903 to 1905.
Boat soundings of previous years.
Ship soundings of previous years.
Survey of shores from 1854 to 1874.
Shores approximately surveyed.
R. Ural
Guriev
R. Volga
R. Emba
ASTRAKHAN
Buzachi Pen.a
Kulali I.
Chechen I.
R. Terek
Agrakhan B.
Petrovsk
Alexander B.
Kenderli B.
Derbend
C. Suc
Kara Bugaz (Black Gulf)
Krasnovodsk
Balkhan B.
Chelekën
Ogurchinsk
Chikishliar
Ashurada I.
Astrabad
Ashref
Hassanabad
Mt. Demavend
Apsheron
BAKU
Naphtha B.y
Krasnaya Kosa
Pristan
Lenkoran
Astara
Enzeli
46
48
50
52
54
36
38
40
42
44
46
48

expedition, which surveyed the Caspian, commenced work in 1714 under the direction of Prince Bekovich, sent by Peter the Great with the special purpose of making a survey of the old bed of the Amu Daria. Bekovich surveyed the eastern shores of the Caspian sea close to the Astrabad gulf, and in his report to the Tzar confirmed the news that eastward from the Caspian there existed another sea—the Aral. On receiving that knowledge the Tzar immediately, in 1716, sent another expedition to make an accurate survey of the Caspian sea under the command of Lieut. Kozin, Prince Ouroussof, and Mr. Travine. The two first made the map of the eastern shores, and the last the map of the western shore. The continuation of this work was committed to Lieut.-Captain von Verden, with his *aide* Lieut. Soimonof and Prince Ouroussof. After a survey of two years (1719–1720), they obtained the geographical position of twelve points and a survey of the western shore from Astrakhan to Persia. Joining the previous work to theirs, they constructed the first approximately accurate map of the Caspian sea, published in St. Petersburg in 1720, under the title "Map of the Caspian Sea from the Mouth of the Jarkowski to the Astrabad Gulf" (Kartina ploskaya morya Kaspiiskago ot ustya Yarovskago do zaliva Astrabadskago). This map had certainly many defects; the longitude is not marked, the north-east point is too long, and the shores between Kenderly and the Gulf of Khiva is not plotted. In 1772 this map was presented by the Tzar to the Paris Academy of Science, of which he was a corresponding member. On this sheet, engraved by Delisle at Paris, the longitude of Astrakhan is given as 47° E. from Paris.

In 1772, during the Persian campaign, various surveys were made, and in the next year there was sent out a foreign officer, Bruce, who stated that he accomplished a journey round the whole basin of the Caspian and constructed a map of it, but there is no copy of this map now extant.

After the death of Peter the Great the Admiralty College ordered a new map of the Caspian sea to be made, because on the one made in 1721 by von Verden, the new provinces and many rivers had not been plotted. Lieut.-Captain Soimonof and Lieut. Dounine were commissioned to the Caspian sea, where they surveyed for two years, 1726–27. The geographical positions of six other places were obtained by astronomical observations; but their work was not found sufficient, and in 1727 Lieut.-Captain Mishoukov was sent to complete this work. On the basis of these surveys was constructed an atlas of eight maps, very roughly engraved, and published in 1731. A new and better map of the Caspian was issued by Admiral Nagaef in 1760.

The insufficiency of the existing knowledge of this basin necessitated, at the end of 1763, the sending out of another hydrographical expedition to make a new and complete survey of the Caspian sea. In the

beginning of 1763 the new expedition was formed under the command of Lieut.-Captain Tokmachev, with two young officers, Panin and Matveev, as assistants. In 1764 and 1765 they surveyed the eastern shores from the mouth of the Oural to the Astrabad gulf. This work was utilized by Lieut. Nagotkin to construct a new map of the sea, but he died before it was completed, and it was only published afterwards in 1796.

In 1787 another survey of the basin was made by Lieut. von Moller. In 1807 Golenistchev-Koutousov published at his own cost a new chart, which, with the chart of Nagaef and the atlas of Soimonof, was employed by seamen till 1826.

In 1828 the Government Admiralty Department ordered pilot officer Kolodkin to make a complete atlas of the Caspian sea, including one general map of it, and four special maps on a larger scale, and plans of some ports, gulfs, and roads. Kolodkin was at work from 1809 to 1813, and in 1826 was published this atlas, containing a general map, four special ones, a plan of Astrakhan, eleven maps of different ports, and two plates of sketches of the shores. This work is an improvement on the preceding, but as pilot-captain Kolodkin was very studious and conscientious, some of his astronomically determined points were not sufficiently accurate; for example, the position of the Isle of Chechen is 10 miles out, and that of Derbend 20 miles. All these defects were the result of a very insufficient supply of instruments at the disposal of the expedition, and of very bad relations between him and the commander of the ships of the expedition. However, this "atlas" was employed about thirty years, and with regard to the southern part of the sea it was sufficiently good. In the neighbourhood of the mouth of the Volga the bar changes very rapidly, because the river alluvium settles there.

With the intention of preparing new and more accurate maps, some of the mouth of the Volga and afterwards the Bakhtemir and other parts of the sea were surveyed between 1823–25 by Lieut.-Captain Bassargin, and some charts containing these new indications were published in 1831, 1837–42. In 1836 the Kara Bugaz gulf was visited by Karelin, who gave some geographical notices about it, published in Vol. 5 of the *Proceedings of the Hydrographical Department;* but the first survey of this gulf was made in 1847, when a war steamship *Volga* circumnavigated the gulf and surveyed it very roughly.

In 1855 the northern part of the Caspian, close to the line drawn from Derbend to Tub-Karagan point, was resurveyed, the shore-lines were made by plane-table work, and all this part of the sea was sounded.

The Pacific Ocean.—The first hydrographical survey in our possession on the shores of the Pacific ocean began under Peter the Great. In 1719 he sent the geodists Evreinof and Loujin to solve the problem

whether Asia touched America or not. They only reached the five Kurile islands, and were forced to return. The report of the expedition was presented to the Tzar in 1722. The question having not been solved, Captain Vitus Bering, in 1725, was sent to Kamchatka as the leader of the first Kamchatka expedition, which continued till 1727, and gave a complete answer on the question at issue.

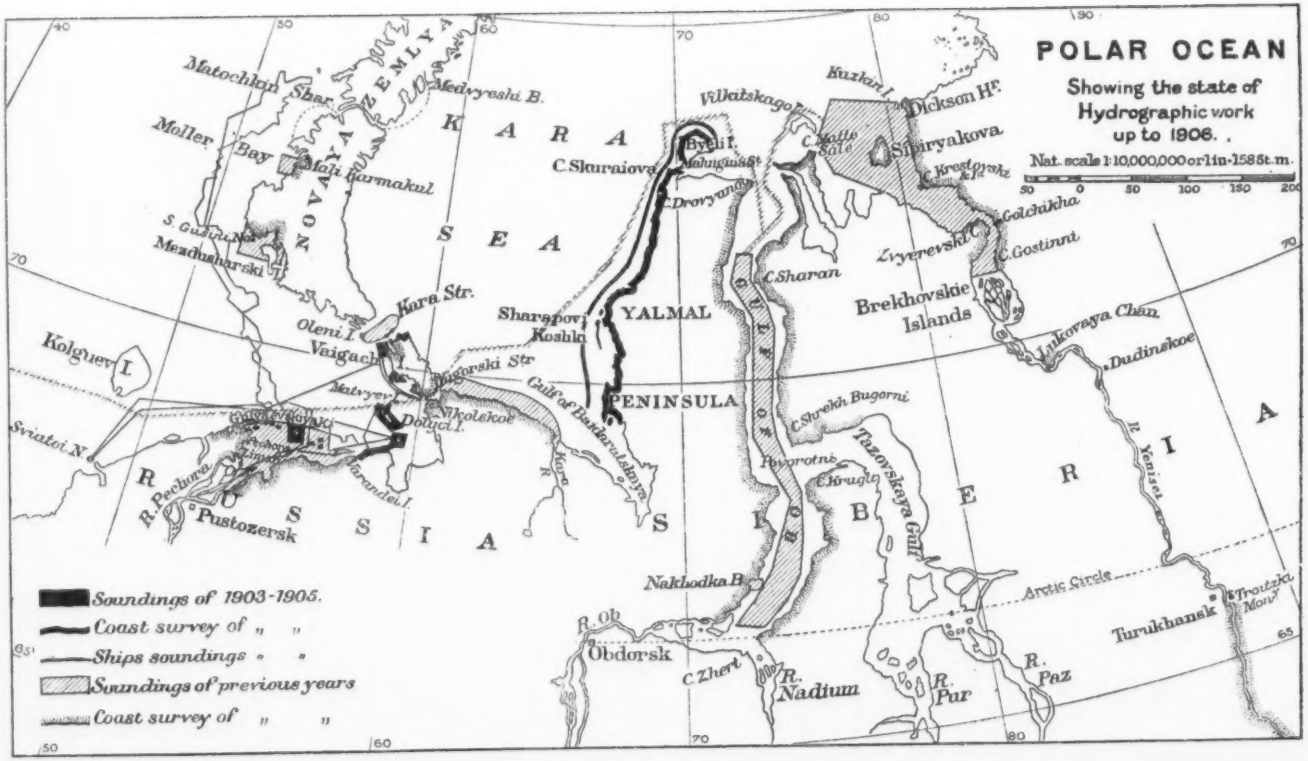
With the intention of surveying the ocean westward of the Kurile islands and reaching the American coast, in 1733, under the command of the same captain, v. Bering, was sent the second expedition (well known under the name of the "Great North Expedition"), part of which surveyed the northern shores of Asia as was ordered, and part of them, under the command of Captain v. Bering, in 1741, after leaving Petropavlovsk, visited the American shores and discovered some of the Aleutian islands. One member of this expedition, Lieut. Khmetevski, in 1743, surveyed the shores of the Okhotsk sea from Okhotsk to Kamchatka and round it. In 1744 a new expedition was sent out with orders to survey the Aleutian groups; the commanders were Captain Krinitzin and Levashev. The ships of the expedition sailed from Okhotsk in 1766 and worked till 1769. The result of this survey was many charts and descriptive reports of different islands of this group.

From 1789 to 1793 Captain Saritchev surveyed the greater part of the shores of the Okhotsk sea, the Aleutian islands, and the shores of America, close to the Isle of Kayak, near the mouth of the Copper river. At the same time (1787–89) Captain Fomin surveyed the south-western corner of the Okhotsk sea, the mouth of the Ouda river; and some time later in 1829–30 the pilot officer, Lieut. Kosmin, surveyed the Ouda river and the Shantar islands. Between 1785–91 Captain Billings made some journeys in the northern part of Siberia, which were described in a work published by him.

In 1851 an expedition was sent under Captain Nevelskoi to survey the mouth of the Amur, which first proved that Sakhalin is an island, and made a complete survey of all the river Amur. Up till 1855 a shore-line of 13,600 versts was surveyed, but it did not give an unbroken line from Bering straits to the Amur.

Marmara Sea.—Besides Russian waters, Russian naval officers surveyed some foreign shores. In 1755–77 the officers of the squadron under the command of Captain Koslianinov constructed some charts of the Sea of Marmara and of the Archipelago; and between 1845 and 1848 a special hydrographical expedition, under Captain-Lieut. Manganari, surveyed and sounded the Sea of Marmara. On these surveys were based the charts of the atlases of that sea published in 1850.

Polar Expeditions and the Circumnavigation Voyages.—Afterwards other expeditions with more extended objects were sent from time to time. One of these was the expedition which, to accomplish the Lomonsovs


POLAR OCEAN
Showing the state of Hydrographic work up to 1906. .
Nat. scale 1:10,000,000 or 1in=158 St. m.
50 0 50 100 150 200
Soundings of 1903-1905.
Coast survey of " "
Ships soundings " "
Soundings of previous years
Coast survey of " "
KARA SEA
NOVAYA ZEMLYA
YALMAL PENINSULA
SIBERIA
RUSSIA
Matochkin Shar
Medvyeshi B.
Moller Bay
Malye Karmakuly
S. Guseva Nos
Mezdusharski
Kara Str.
Oleni I.
Vaigach I.
Kolguev I.
Sviatoi Nos
Pustozersk
R. Pechora
Gavrandei I.
Matveyev
Nikolskoe
Dolgui I.
Bugorski Str
Gulf of Baidaratskaya
Sharapova Koshka
C. Skuraiova
Byeli I.
Maluginski Str
Dvoryanski
Vilkitskago I.
Kuzkar I.
Dickson H.
C. Molle Sole
Spiryakova
Krestovaya
Golchikha
Zyzyerevski C.
C. Gostinni
C. Sharan
Brekhovskie Islands
Lakoraya Chan
Dudinskoe
C. Shrekh Bugorni
Tazovskaya Gulf
Povorotni
C. Kruglo
R. Yenisei
Nakhodka B.
R. Ob
Obdorsk
C. Zhet
R. Nadium
R. Pur
R. Paz
Arctic Circle
Turukhansk
Troitzka Mon.
65
50
60
70
80
90
40

project, started twice from Archangel in 1765 and 1766, under the command of Captain Tshitshagov, with the intention of searching for a passage through the Polar sea to Kamchatka. The expedition was unsuccessful in its object; both years it only reached the shores of Spitsbergen, lat. 80° 30′ N., and could not go on through the polar ice.

In 1819 two new expeditions were sent to investigate both the polar basins, south and north. The first, under the command of Captain Bellingshausen, consisted of two ships, *Vostok* and *Mirny* (Captain Lazarev), and was designed to visit the Antarctic ocean. After leaving Kronstadt in July of 1819, both the ships, after a two years' voyage, accomplished a complete circumnavigation of the south polar sea, almost always southward of the polar circle. In their voyage they touched 69° 48′ S. lat., discovered many new islands and the south-western shores of the Antarctic continent. The second expedition was designed to search for a passage from Bering straits to the Atlantic ocean. It consisted also of two ships, *Otkritie*, Captain Vasiliev, and *Blagonamerennui*, Captain Shishmarev. They started from Kronstadt in July, 1819, rounded the Cape of Good Hope, and arrived in Petropavlovsk, from where they started to Bering straits. After a voyage of three years, the expedition returned to Kronstadt in 1822; it surveyed a great length of the shores of America in the Polar sea, and some of the shores of Asia, but the principal object—the search for the passage through the polar basin to the Atlantic ocean—was not attained; very heavy pack-ice, met by the expedition, barred the way.

The first Russian circumnavigation voyage began in 1803 with the expedition under the command of Lieut.-Captain Krusenstern on the *Nadejda*, and Lieut.-Captain Lisyanski on the *Neva*. This voyage occupied three years, during which many geographical discoveries were made. After this expedition many others were sent out till 1848; there were in all thirty-four, fifteen of them sent by the Russian-American Company, one by a private gentleman, and eighteen by the Imperial Navy. Amongst these expeditions there were some of great scientific interest, such as that under Krusenstern and many others, but two of these, sent in 1826 on the sloop *Seniavin*, Captain Lutke, and in 1815 at the cost of Earl Roumyantzef, on the brig *Rurik*, Captain Kotzebue, were especially devoted to scientific purposes. The first surveyed many coasts of islands in the Pacific; Captain Lutke made a great number of pendulum observations still of great value. The second was unsuccessful in his main duty of discovering a passage from Bering strait to the Atlantic ocean, but he made a great number of oceanographical investigations and many surveys of the North American shores.

A third expedition on a warship, the sloop *Predpriyatie* (1823–1826), under Captain Kotzebue, although sent for administrative purposes on the shores of Russian America, made a very interesting oceanographical

investigation with a set of instruments especially invented and constructed for the expedition. The expedition possessed a water-bottle, the sides of which consisted in layers alternately of thin iron and thick cloth impregnant with wax and fat. Because of this construction, the interior temperature of the sea-water was very little altered by the exterior layers of water, the thermometer being in a very thick glass. The necessary corrections to the thermometer's readings were determined by a previous essay.

Anticipating Sir William Thomson (Lord Kelvin) by fifty years, the naturalist of the expedition, E. Lenz, and the member of the Royal Academy, Parrot, invented a sounding-machine with a brake and a dynomometer, with intention to facilitate the determination of the true moment when the sounding-lead touch the bottom. Some of the points in which the observations were made are situated near the points of the *Challenger*, and the comparison of them shows very little difference in temperatures observed (between $0°{\cdot}2 - 0°{\cdot}3$ C.) for the deep layers (1000 metres and more).

Lakes.—Besides this work, the Russian naval officers made some hydrographical surveys of lakes. The first Russian chart of Lake Ladoga was dated from the early part of the eighteenth century. The next chart was obtained after some work by Lieut.-Captain Selyanikof in 1763–65; this chart was not published, and in 1779, after being completed from the work of Lieut. Boulgakov with his aids, was engraved and published in 1812.

When General Shubert's triangulation and the survey based upon it were achieved, the Hydrographical Department published in 1845 a new chart of Lake Ladoga, on which the soundings were given from the old charts, but the shore-line was new.

Till 1855 no survey was made of Lake Onega.

The Aral sea was first surveyed by the geodesist Mouravief in 1741, and upon his work was based the first chart, which was published at the same time. More than a hundred years passed before investigations were renewed in these parts of Asia. It was not till 1847 that the second expedition, under Lieuts. Boutakof and Mertvago, was sent; their work continued three years, and on the basis of their material three new charts of the sea and its description were published.

Lake Baikal was surveyed first by the pilot officer Poushkaref in 1772–73, and a chart of the lake was constructed by him. The first soundings of the lake were made in 1837 and 1859.

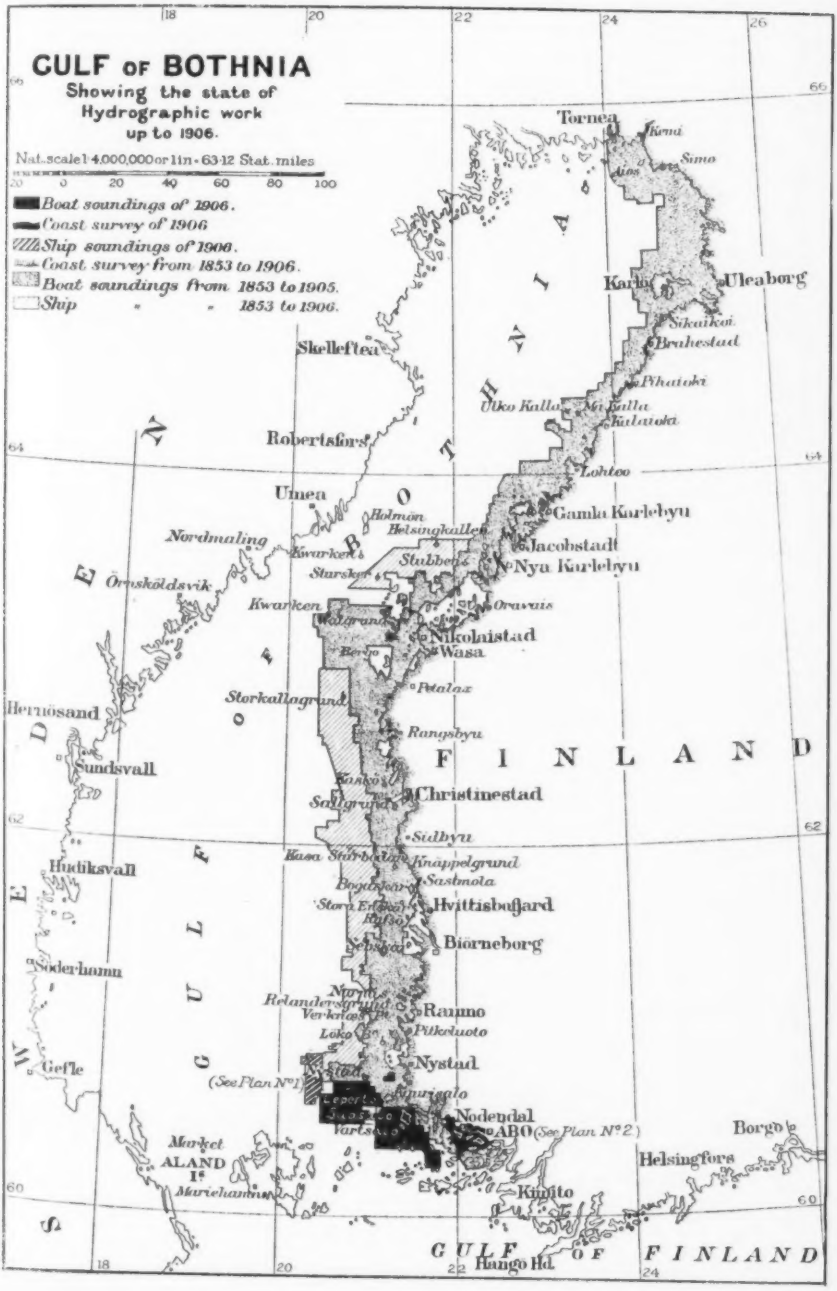
With the year 1855 finishes the first period of the Russian hydrographical surveys, when surveys of many different waters were ordered and made without any consistent definite plan elaborated previously. In 1854 this was regulated, and the Annual Report of the Hydrographical Department published regularly, containing fuller and more accurate data concerning this work. Helped by this set of Reports,

it is possible to prepare a short notice on the hydrographical survey of each of the Russian seas separately from 1855 until the present time.

New Records from 1855 to 1905.

White Sea.—The Hydrographical Department, till the year 1856, claimed the necessity of a new and more complete survey of the White sea, but this claim received satisfaction only in 1884. After the first and incomplete survey made by Reinecke in 1827–32 there were no systematic surveys, and all the hydrographical work was done close to the mouth of the Dvina and in some other points on the shore of the sea, but quite isolated and without any connected plan. The most important of these were the survey of the roads off the mouth of the Kem in 1864–65 by the pilot officers Mordovin, Staluigin, and Koslof, and the survey of the mouth of the Mezen and its bay in 1876–78, made by the pilot officer Nyukhalof, and of the roads of Onega by the pilot officer Akhatkin.

In 1884, after many requests from sailors and the Government authorities at Arkhangelsk, the Naval Ministry decided to organize a systematic survey of the White sea; and first it was determined to begin by the survey of Oñega bay. In 1884 the pilot officer Myakishef, with six chronometers, obtained the difference of longitude of ten points on the shore of the bay, and in 1885 the survey began by the mouth of the Onega. But the true systematic survey began only in 1887, when an expedition, the first chief of which was Baron Maidel, was sent to make a complete hydrographical survey of the White sea. The west shore of Onega bay was triangulated, and on the basis of this triangulation began the plane-table survey of the bay of Soroka. In the same year the longitude of Archangel was determined by telegraph by Lieut. Wilkitski and the astronomer Wittram in Pulkovo, with the probable error $\pm 0{\cdot}056^s$. In 1888–89–90–93 were surveyed the bays of Onega and Soroka, and the roads of Solovetski islands, a part of the bay of Kadalaksha, and the survey of the shores of Onega bay has been continued till the present time. The present state of hydrographical work can be seen on the map of the White sea appended to this notice. There it is clearly seen that up to the present time the whole White sea has only been roughly surveyed and sounded. The open sea has been surveyed by soundings from a ship, and the roads and the approach to them at Archangel, Onega, Suma, Kem, Kovda, Kadalaksha, Mezen, have been surveyed by soundings taken from a launch. These main results, which make it possible to navigate the shores of this basin, are not now considered as the final results of the hydrography of the White sea, and the General Hydrographical Administration (the actual official name of the late Hydrographical Department) are continuing the survey of the White sea. A new and most accurate triangulation has been made of the shores of Onega bay, on the basis


GULF OF BOTHNIA
Showing the state of Hydrographic work up to 1906.
Nat. scale 1:4,000,000 or 1 in = 63·12 Stat. miles
20 0 20 40 60 80 100
Boat soundings of 1906.
Coast survey of 1906
Ship soundings of 1906.
Coast survey from 1853 to 1906.
Boat soundings from 1853 to 1905.
Ship " " 1853 to 1906.
Tornea
Kemi
Simo
Ajos
Karlo
Uleaborg
Brahestad
Skellefteå
Ulko Kalla
Kalaaska
Robertsfors
Lohtee
Umea
Holmön
Helsingkallen
Gamla Karlebyu
Nordmaling
Jacobstadt
Nya Karlebyu
Örnsköldsvik
Kwarken
Oravais
Nikolaistad
Wasa
Hernösand
Storkallagrund
Petalax
Rangsbyu
Sundsvall
Christinestad
Sidbyu
Hudiksvall
Knappelgrund
Hvittisbußard
Biorneborg
Söderhamn
Raumo
Nystad
Gefle
Nodendal
ABO (See Plan N° 2)
Borgo
Market
ALAND I.
Helsingfors
Kimito
Hango Hd.
GULF OF BOTHNIA
GULF OF FINLAND
SWEDEN
FINLAND

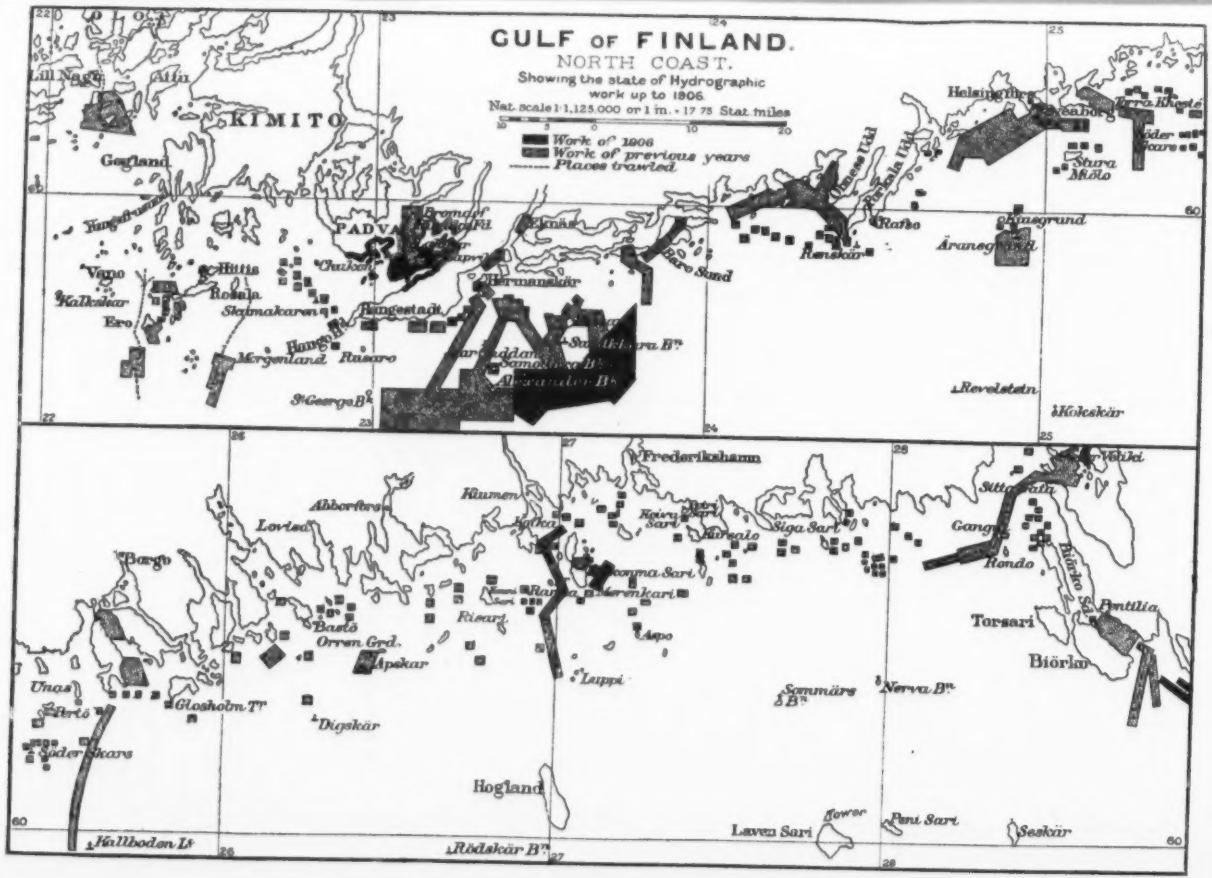
of which a new survey is being made. The principal object of this work is to cover the shores of the whole sea by a network of triangulation, which can alone make it possible to prepare accurate charts. At the same time the most dangerous parts of the White sea were resurveyed in last years; for example, the Orlov banks at the entrance from the Polar ocean to the sea.

Polar Ocean.—In the Polar ocean the most frequented coast is the so-called Murman coast lying between Norway and the entrance to the White sea. This part of the shores of Russia has never been surveyed regularly. The only work done there is the survey of different isolated places, and a preliminary survey of the main part of this coast is due to the well-known Russian naval officer, Captain Lutke (afterwards Count Lutke), who, in his cruise in the Polar ocean, in 1821–24, surveyed the main part of the Murman shores and the greater part of the shores of the island Novaya Zemlya. His work was continued by Lieut.-Captain Reinecke, and the survey of the Murman coast up to Norway was finished in 1832. From this time till the present many other surveys have been made on this shore, but they belong to the survey of different isolated places, such as certain roads, entrance to roads, etc., especially in the last years by the hydrographical expedition of the Polar ocean under Colonel Wilkitski. In the summer of 1904 the difference of longitude between the port of Alexandrovsk and Pulkovo was obtained by means of the telegraph, and a regular survey of these shores began in 1905 under Lieut.-Captain Bukhteef.

The greater hydrographical work of the last years in the Polar ocean was made by a special so-called hydrographic expedition of the Polar ocean. The first investigation began in 1894, under Lieut.-Colonel A. Wilkitski, and during the first time the work of it was consecrated to the hydrography of the sea route to Siberia. The mouth of the Yenissei, the gulf of the Yenissei and the river itself were surveyed up to Yenisseisk; after this the shores of the Polar ocean were surveyed close to Dickson bay on the east, and the entrance of the Obi gulf on the west. Later, the Obi gulf, the mouth and the river close to the Samarovo and its tributary the Irtish to Tobolsk were surveyed. The northern part of the isle Belui, some parts of the shores of Kara sea, and the delta of the Pechora were also surveyed, as some points on the Murman shores. In 1902 the expedition under Lieut.-Captain Warneck, and finally (1903–1904) under the command of Colonel Drijenko, continued its work in the Kara sea, on the shores of the Novaya Zemlya, on the Murman shores in the Pechora estuary, where the timber trade, especially with England, has lately been much developed.

Great were the geographical results of this expedition; they were given by me in a special notice, published in the *Journal* some time ago, and it is unnecessary to repeat the detail of that work.*

* *Geographical Journal*, 1898, vol. 12, pp. 172–176.


GULF OF FINLAND.
NORTH COAST.
Showing the state of Hydrographic work up to 1906.
Nat. scale 1:1,125,000 or 1 in. = 17.75 Stat. miles
Work of 1906
Work of previous years
Places trawled
KIMITO
Gesland
PADVA
Vippo
Kalkskar
Ero
Hittis
Rosala
Skamakaren
Mörgenland
Rusaro
St George B.
Hangestadt
Hermannskär
Rafsö
Revelstein
Frederikshamn
Abborfors
Lovisa
Borgå
Basto
Orren Grd.
Apekar
Glosholm T.
Digskär
Söder Skars
Hällbodan Lt.
Hogland
Rödskär B.
Leppi
Fisari
Klumen
Siga Sari
Gangut
Rondo
Torsari
Biörkö
Sammärs B.
Nerva B.
Laven Sari
Seskär
Helsingfors
Sabor
Skuru Mölo
Åbo Sand
Ränskär
Åbo Fl.
Åbo
Hökskär

Novaya Zemlya was partly surveyed many times. The first survey has already been mentioned. Since the year 1882 many small expeditions have visited the shores of these isles and have surveyed various localities, but the whole outline of these isles has never been charted, and the position of the northern end of the group has not yet been ascertained by reliable astronomical observations.

In the last few years many new and good surveys have been made in the Belushya bay by Lieut. Bukhteef, and in the Matochkin Shar, in the Yugorski Shar, round the west coast of Vaigats island, and in the Kara strait by the hydrographical expedition of the Polar sea, at first under the command of Colonel Wilkitski, secondly Lieut.-Captain Warneck, and finally Colonel Drijenko. From the point of view of navigation in these waters, the most important work was the hydrographical survey of the Yugorski Shar and the shores of Vaigats island, on the south-west of which good anchorage was found in the bay of Warneck; and in the north-west, near the entrance to the Kara strait, the Dolgaya Guba, where, beside a group of islands (Belkin, Shokalsky, and others), there are good roads for ships.

Baltic Sea.—In this basin regular hydrographical work is continued every year, but its progress is slow, because the hydrographical survey of such a place as the "Shärgoord" of Finland is a very difficult work. At the present time the hydrographical survey is being made in the Åland islands, on the shores of the Gulf of Bothnia, and in some other places, where the necessities of navigation require a more thorough and accurate survey. In the last years the survey of the Kronstadt and Transund roads has been completed by accurate winter soundings, entailing very hard work on the officers and men, but which give a full and accurate idea of the contour of the sea-bottom. The entrance to Khotka harbour is also being sounded in the same way. The present state of the work is clearly shown on the chart accompanying this notice.

Black and Azov Seas.—In the Black sea the hydrographical survey, after reaching the middle of the eastern shores, has been removed to the Azov sea, the shores of which have lately been surveyed, and the approaches to the main ports, such as Rostov, Taganrog, Berdiansk, Mariupol, Eisk, and others have been sounded.

The triangulations made in the Black and Azov seas during the years 1873–1903 to the end of this period surrounded the shores of these seas from the Danube to Sukhum on the other side of the Black sea, and also the whole of the Azov sea. The total length of these coasts is about 2600 versts. The whole net of this triangulation consisted of seven separate triangulations, each starting from different bases and astronomical points. In spite of very satisfactory accurateness of each separate triangulation as a first-class one, in all districts where the separate triangulations joined one another the discrepancy, partly on

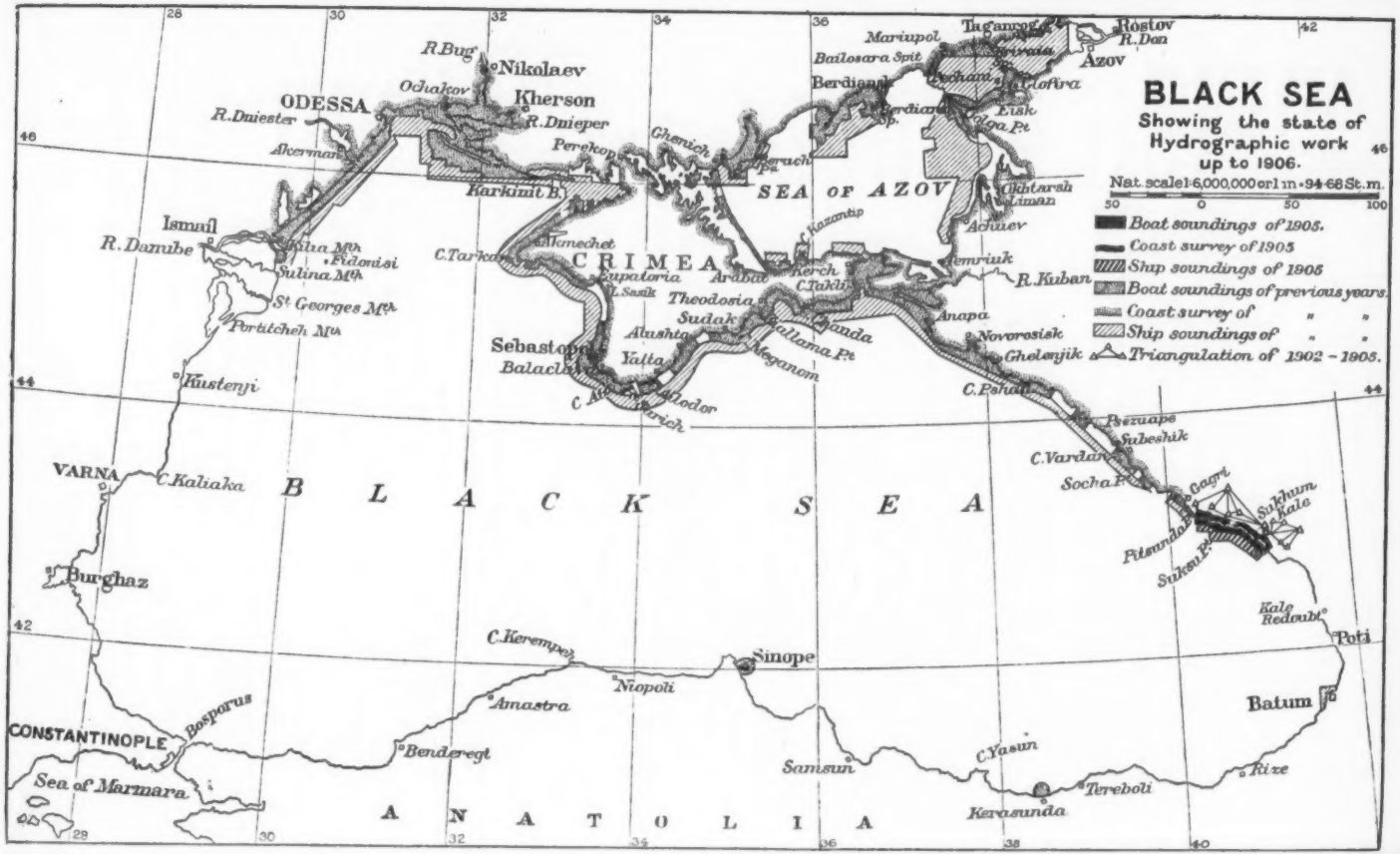
account of the deviation of the vertical line, especially in the Crimea and Caucasus, and partly on account of accumulation of errors, was very great, attaining here and there 200 sagens. The chief of the Main Hydrographical Administration, in order to obviate this difficulty, charged Captain-Lieut. Bukhteef to make the compensation of all these triangulations of the Black and Azov seas, taking as a base-point the position of the Naval Astronomical Observatory at Nikolaev. The method of compensation chosen was that used in the triangulation of India.*

The main idea of this work is to obtain a consecutive system of points, the comparative positions of which are sufficiently accurate (corresponding to the accuracy of the triangulation itself) to be taken as a basis for future hydrographical and cartographical work in the Black and Azov seas. The work of the compensation was based on the dimension of the earth determined by Bessel instead of those of Valbeck, which are used to calculate each separate triangulation. At the beginning it seemed that this duty would occupy a period of five years, but, thanks to the exceptional diligence of Mr. Bukhteef, all the work was finished in two years, and now is completed. The sufficient accuracy of all the separate triangulations made it possible to compensate very well: the final result shows that the whole net of triangulation could be compensated with agreement of 0″·001 in latitude and longitude of all the points, without altering original angles of the triangles more than 5″; as the probable error of the original angle is +2″·3, this result is wonderfully good.

The chart accompanying this notice shows most clearly the present state of our knowledge of the hydrography of these seas.

Caspian Sea.—The charts of this basin are based on the work of the hydrographical expedition, which began its work in 1856 under the command of Lieut.-Captain Ivashintsef. The hydrographical survey of this sea is based on thirty-two main and some secondary astronomical points which the expedition determined. This duty and the survey of the different shores, and taking the soundings, occupied many years from 1856 to 1874. The expedition was under the command of Lieut.-Captain Pushtchin, when results of that eighteen years' hydrographical work were published in two volumes of the description of the work done; an atlas of that sea, containing one general chart, three sailing charts, and thirty-two more detailed charts and plans; two atlases of the river Terek and Kura; three magnetical charts, based on the determinations of the three magnetical elements, in fifty points distributed on the shores of the sea; a chart of currents, and three charts of winds. Further, in 1877 there was published a final volume, due

* 'Account of the Operations of the Great Trigonometrical Survey of India vol. 2. 1899.


BLACK SEA
Showing the state of Hydrographic work up to 1906.
Nat. scale 1·6,000,000 or 1 in ·94·68 St.m.
50 0 50 100
Boat soundings of 1905.
Coast survey of 1905
Ship soundings of 1905
Boat soundings of previous years.
Coast survey of " "
Ship soundings of " "
Triangulation of 1902 – 1905.
BLACK SEA
SEA of AZOV
CRIMEA
ANATOLIA
ODESSA
Nikolaev
Kherson
R. Bug
R. Dniester
R. Dnieper
R. Danube
Ismail
Akerman
Perekop
Harkimt B.
C. Tarkan
Kamechet
Eupatoria
L. Sasik
Theodosia
Sudak
Alushta
Yalta
Balaclava
Sebastopol
Aitodor
Kerch
C. Takli
Arabat
Genitchi
Arabat Spit
Berdiansk
Mariupol
Taganrog
Rostov
R. Don
Azov
Ochakov
Kilia Mth
Sulina Mth
St. Georges Mth
Portitcheh Mth
Kustenji
VARNA
C. Kaliaka
Burghaz
C. Kerempe
Sinope
Niopoli
Amastra
Bosporus
CONSTANTINOPLE
Sea of Marmara
Benderegi
Samsun
C. Yasun
Kerasunda
Tereboli
Batum
Poti
Kale Redoubt
Ptsunda
Sukum Kale
Gagri
Socha
C. Vardan
Subeshik
Psezuape
C. Pshad
Novorosisk
Anapa
R. Kuban
Temriuk
Achuev
Ukhtarsh Liman
Olga Pt.
Lisk
Kazantip
Yenikale
Ghelenjik
Meganom
Aitodor
Feodosia
Kaffa
Ak Monai Pt.
Ak Burun
Tarkhan Pt.
Berdiansk Sp.
Mariupol
Taganrog
Rostov
Azov
Ochakov
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Nikolaev
Ismail
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Kilia
Sulina
Fidonisi
St. Georges
Portitcheh
Kustenji
Varna
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Constantinople
Sea of Marmara
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Samsun
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Kale Redoubt
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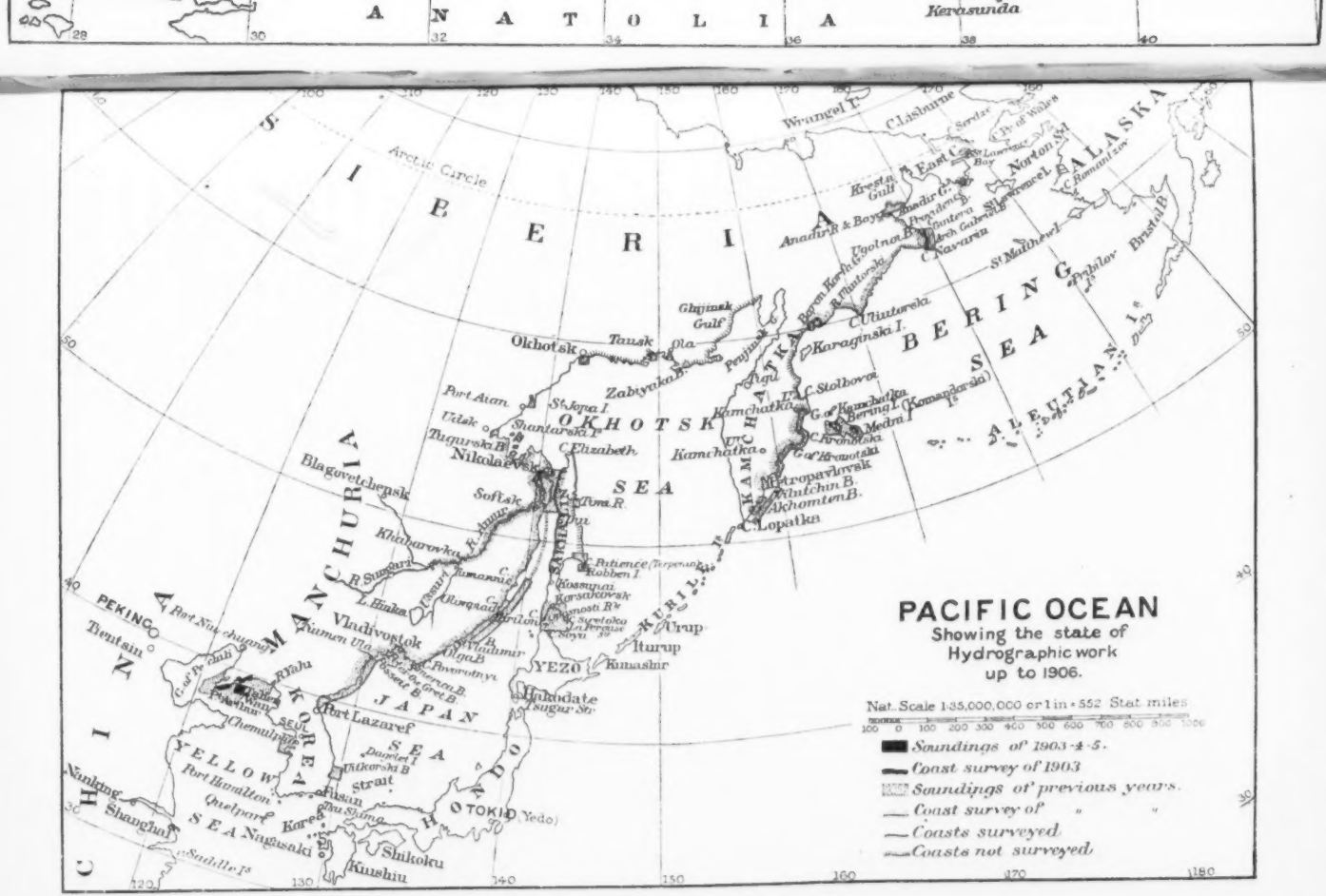

PACIFIC OCEAN
Showing the state of Hydrographic work up to 1906.
Nat. Scale 1:35,000,000 or 1 in = 552 Stat. miles
Soundings of 1903-4-5.
Coast survey of 1903
Soundings of previous years.
Coast survey of " "
Coasts surveyed
Coasts not surveyed
SIBERIA
ALASKA
BERING SEA
OKHOTSK SEA
JAPAN SEA
YELLOW SEA
KAMCHATKA
ALEUTIAN Is.
KURILE Is.
MANCHURIA
CHINA
KOREA
JAPAN
YEZO
HONDO
Arctic Circle
Okhotsk
Nikolaevsk
Petropavlovsk
Vladivostok
Hakodate
Port Lazaref
Port Hamilton
Shanghai
Nagasaki
Kushiu
Shikoku
TOKIO (Yedo)
PEKING
Behring I.
Copper I.
Attu
Kerasunda

to Lieut.-Captain Pushtchin, containing the hydrographical description of the sea and pilot directions for it. From this time no systematic hydrographical work has been done, excepting only in the parts of the sea where the business of navigation demanded a new investigation.

Pacific Ocean.—Till 1862 the only hydrographical survey on the shores of the Pacific ocean consisted in a few preliminary surveys of some bays and roads in the sea of Okhotsk and other places belonging to Russia. This survey had been made without any systematic plan by the naval officers of different men-of-war navigating these waters. The first true hydrographical survey began in 1862, when an expedition was organized under the command of Lieut.-Colonel Babkin, who in four years surveyed the shores from the Korean frontier up to Gamof point, and from Vladivostok to Suifun; also the mouth of the Amur and Sakhalin channel were sounded in the winters of 1864–66.

In order to obtain a better basis for the hydrographical survey, Lieut. Staritzki was sent there in 1866. In five years he determined the geographical position of thirty-eight points on the shores of the Japan, Okhotsk, and Bering seas; he observed, also, the magnetic declination in twenty points, inclination in sixteen points, and the horizontal force in four points. He had made the plane-table survey of five roads on the shores of Sakhalin, and a naval survey of a portion of the western shores of this island. Lieut. Yelagin continued the work of Lieut. Staritzki.

At the end of 1871 Lieut. Onatzevitch was placed at the head of the hydrographical survey of the Pacific Ocean, and at the same time another expedition, sent by land, under the command of Lieut.-Colonel Bolshef, surveyed the shores of the Japanese sea and of the Tartar strait for a distance of 800 versts, and for 3 versts into the interior of the country.

Lieut. Onatzevitch, besides different hydrographical surveys on the shores of the Japanese, Okhotsk, and Bering seas, did some oceanographical work in the Arctic ocean.

From the year 1877 till 1885 surveys were made in different places of the Russian shores of the Pacific ocean, principally in the delta of the Amur river and around Vladivostok. From 1855 till the end of the century surveys were made generally in the bays of Amur and Ussuri, and along the shores of the Japanese sea between Vladivostok and Korea and westward of Vladivostok. All this work was based on good triangulation, which extended all along these shores.

At the same time many other hydrographical surveys were made with the intention of improving the present charts, which are very incomplete and not sufficiently accurate, especially as regards the shores of the Okhotsk and Behring seas, and Arctic ocean. This work was done by the officers of the different men-of-war, which had navigated in these waters for different purposes. Amongst these vessels it is

interesting to remember the work of the *Vitiaz*, on board of which S. Makaroff made a great quantity of different oceanographical investigations in many places of all the seas touching these shores, published afterwards by him in the work entitled '*Vitiaz* and Pacific Ocean.'

In later years there was a special hydrographical expedition, under the command of pilot officer Colonel Jdanko, well known for his hydrographic investigations in the Baltic and White seas and in the adjacent parts of the Polar ocean. He did a great deal of work, especially on the shores of the Yellow sea and in the Tartar strait.

The chart accompanying this notice shows clearly the present state of the hydrography of the Russian shores in the Pacific ocean.

SOME NOTES ON DAR HOMR.

By Captain WATKISS LLOYD, the Scottish Rifles.

THE following notes are the result of four journeys made between June, 1904, and February, 1906. A glance at the map will show that much remains to be explored, although the general character of the country is now well known.

Dar Homr, or the country of the Homr Arabs, is situated in the south-west corner of the province of Kordofan. The western boundary is the Darfur frontier, beyond which live the Rizeigat Arabs. On the north, the boundary passes through El Odaiya, now the headquarters of a Merkaz, or administrative district, and thence south-eastwards, passing south of Burdia and Jebel Dago to Keilak. El Odaiya is in the Hamr country, the inhabitants being a sedentary tribe of Arabs. Burdia and Jebel Dago are in the Messeria, and Keilak in the Hawazma country. Both these tribes, like the Homr, are Baggara Arabs—that is to say, cattle-owning nomads. The southern boundary is between the Bahr el Arab and the river Kir, the latter being occupied by the Dinkas under Sultan Rob.

The whole forms a vast and almost level plain, covered with thick bush and a few scattered tebeldi trees (*Adansonia digitata*). Except in the Mumu district near El Odaiya, they are never sufficiently numerous to provide water storage for a village. At Mumu they are hollowed out and filled every year as in Dar Hamar.* In the north the soil is reddish sand, interspersed with tracts of sand and clay mixed, forming a soil called "gerdud." This gradually increases further south until the red sand disappears, and black soil commences. South of lat. 10° 30′ black soil predominates. When dry it becomes full of shrinkage-cracks, and is locally called "shegantoi." In a few places where the

* *Vide* the Compendium of the Anglo-Egyptian Sudan. Map, p. 700.

underlying rock can be seen, as at Um Hagar and south of Jebel Abu Likri, it is red sandstone, containing much iron, and similar to that found near Wau in the Bahr el Ghazal province.

The arable land consists of ridges of grey sandy soil found chiefly in the vicinity of Muglad and Baraka. These ridges, which are seldom more than 10 or 12 feet high, are divided by level strips of "gerdud" soil called "dandaana," in which there are small swampy pools called "kubbu." In the rains the Homr Arabs take up their quarters near these ridges, and cultivate dukhn, their only crop, watering their flocks and herds from the pools, which hold water from six to eight weeks after the last storms, according to the year.

Between Mumu and Muglad there is a tract of sandy soil which is uninhabited owing to the absence of either tebeldi trees or "kubbus." In the south, where the black soil predominates, the country is broken by "ragabas." These consist of depressions full of grass and creeping plants. During the rains they are under water, and the rest of the year water can always be obtained by digging down a few feet. In many the surface water never dries up. There are no signs that the water in them ever flows, the mud and vegetation forming a water-logged mass. Where "gerdud" soil exists, it is broken up by strips of black soil known locally as "shellal." These form a serious obstacle to travelling for some time after the "gerdud" soil is dry.

The country is traversed by two main watercourses, the Wadi el Ghalla and the Khor Shalango. The Wadi el Ghalla rises near Abu Gulb in Dar Homr, and, flowing through El Sinut and Burdia in Dar Messeria, continues its course to Um Guru, and thence south of Muglad district to Dar Rizeigat, where it is said to lose itself. It breaks into many channels, which separate and join again, and is fed by numerous small khors. During the rains it holds much water, but there is little or no flow throughout, as its channel is blocked with trees and grass. In the dry season wells are dug at many points in its bed. As it is smaller at Muglad than at many points higher up, it would seem to be silting up and turning into a "ragaba" at its southern end, just as at its northern end near Abu Gulb it is filling up with sand blown from the north.

The Khor Shalango rises north-east of Jebel Dago, flows westward at first, and then southwards, passing north and west of Jebel Dago in a channel 30 yards wide and 25 feet deep. When east of Turda it breaks into several small channels, and finally loses itself near Fauel in the swamps which are connected with the Bahr el Arab. When in flood it overflows its banks, and inundates a vast extent of country on both sides to a depth of 18 inches, to judge from the marks on the trees. The vicinity of the hills, and hence its greater fall, has kept the channel clear until near the latitude of Turda.

In the rains the whole of the country south of a line from Muglad to

Jebel Dago is more or less under water. North of this line there are plenty of pools holding water for two or three weeks after the last storms. About six weeks after the last storms the pools in Muglad dry up, followed by the pools and khors further south, until by about the middle of December the only surface water is found in the wells and "ragabas," and the Muglad district has to be deserted. As soon as the grass is dry enough to burn, the people move south, burning it before them to the ragabas, where there is surface water, and finally, as the ragabas dry up, to the Bahr el Arab, where they remain until the rains break. Then, as soon as the pools fill, and before the country has again become a swamp, they return northwards to their rain quarters.

In addition to the wells in the Wadi el Ghalla and Khor Shalango, there are a few places near Baraka where there are permanent wells.

The chief roads are well-worn cattle-tracks. North of Muglad there is enough sand in the soil to render them passable all the year round. In the south, however, they are generally impassable, owing to mud and grass, until a month or two after the rains, which commence in the middle of May and sometimes last to the end of October, but are heaviest in June and July. Once open, they are fairly good, except where cut up by elephant-tracks.

The Homr are divided into two chief divisions—the Ageira under a nazir, Sheikh Ali Gulla, and the Felaita, who have no nazir. They say they came from Northern Africa *viâ* Wadai, and have probably not occupied their present country for more than a hundred years. They say they preceded the Hamar, who entered Kordofan during the first quarter of the last century. They speak a purer Arabic than the riverain Arabs. The Ageira are divided into the Walad Kamil and the Walad Omran. During the rains the Walad Kamil cultivate the western and southern parts of Muglad district, and afterwards are found on the ragabas west of the Turda-Fauel road. The Walad Omran have their cultivation in the eastern part of Muglad district and at Baraka, and afterwards go to the ragabas east of Turda and Fauel. The Falaita, who are only half as numerous as the Ageira, are divided into the Metanin, who live at Mumu, now practically a sedentary tribe, depending on El Odaiya wells for their water in the dry season, the Walad Serur at Keilak, and the Salamat and Gubarat at the Abiad lake; but many of the last three sections cultivate on the Wadi el Ghalla, north-east of Baraka, and more east of the Walad Omran camps in the dry season. Each tribe has its own place for cultivation, its own ragabas, and its own line of migration, all which change but little from year to year.

The tribe was formerly very numerous and wealthy, but suffered severely in Dervish times. The greater portion were fanatical followers of the Mahdi and his successor, and lost heavily in the various campaigns

between 1884 and 1899. The few who remained behind were constantly raided and harassed by recruiting parties of Dervishes.

They are a wild and rather insubordinate lot, and pay but little respect to their own sheikhs. They are, however, settling down, though many look back with regret to the merry times when, as relations of the Taisha and favourites of the Khalifa, they could rob and raid as they liked, while those sheikhs who were emirs no doubt feel their fallen greatness. On the other hand, they are in many ways one of the best tribes in Kordofan. Petty crime is practically unknown, while murder is uncommon and generally due to quarrels about women. Murders are still settled by payment of blood-money, thirty cows being the usual price for a man. The fine is paid to the nearest relation of the murdered man. The case is usually settled by the local sheikhs, who afterwards inform the British inspector. Being dependent on public opinion for their influence, the decision of the sheikhs is usually a just one, and the fear that the Government may hang an offender prevents them from screening even their own relations. Cases of drunkenness are rare. From time to time they have quarrels with the Dinkas. These are usually due to elephant poaching by the Arabs, who have the most democratic ideas about game. Nothing will persuade an Arab that he has no right to hunt in another tribe's country.

Practically the only crop grown is dukhn (millet). As soon as this is ripe, usually by the first week in November, it is threshed, and enough for seed and food during the next rains is stored in trees, the remainder being loaded on bulls and taken to the summer camps. Should the supply be insufficient, grain is exchanged for sheep or cows with the Nubas or Dinkas.

With the exception of a few leather goods, such as *khurgs*, or skins for water or grain, nets to carry water-pots in, and bridles, the Homr manufacture nothing. They buy their pots from Jebel Dago or El Odaiya, and cotton from travelling merchants or from El Odaiya.

Constantly on the move in search of water or fresh grass, their camps are of the most primitive description. In the rains some live in small and badly built straw huts (*tukls*) of the pattern usual in the Sudan, but the majority content themselves, both in the dry and wet seasons, with a few sticks covered with a quantity of grass, the whole not more than 10 feet high. The shelters of neatly plaited matting made by the Hawazma and Messeria are never seen owing to the absence of dom and deleib palms, from the leaves of which they are made. The camps as a rule consist of only three or four families, and are widely separated. This is due to the scattered nature of the ridges on which they cultivate in the rains, and the abundance of water for the cattle at all seasons. As a result the tribal organization is much looser, and the influence of the sheikhs much less, than in most nomad tribes.

Their wealth consists of cattle, sheep, and horses, all of which have much increased of late years. The bulls are small but strong, active animals, and will wade through mud that would stop any horse or mule. The saddle consists of two pads of plaited grass called *tibn*, which grows in the swamps. The lower pad is plain; the upper one has one, or sometimes two, trees made of a forked stick tied to it. The load averages 200 lbs., with a man or woman to balance it, no girth being used. A string is passed through the nose, but is seldom used unless it is necessary to tie the animal up.

The sheep are of two kinds: the large Roman-nosed sheep of the Sudan, and the smaller and more active animal of the Nuba hills.

Their horses are small, and are a very mixed lot, having been bought during the last few years from merchants and from the Messeria. They nearly all show signs of having been worked too young. Every year a good many die from horse-sickness.

Camels are not used, and the animal of the Camel Corps, in out-of-the-way places, is generally a source of terror to the small children, who, as elsewhere in the province, swarm in every camp. They are naked, healthy youngsters, who live chiefly on milk.

Their household utensils are simple, and do not differ much from the other tribes in the Sudan. Most own a very short and narrow bedstead (*angareb*). The rest, when in camp, drive forked sticks 18 inches long into the ground and lay poles across on which to spread their mat or sheepskin; this is called a *hasira*. Many own grindstones (*murhaka*); the rest crush the grain with a wooden pestle (*amud*) and mortar (*fanduk*). A few earthenware pots (*kantush*) carried in leather nets (*maluk*), some wicker baskets (*omra*), water-tight with dirt for milk, and some skins for grain and water, complete their outfit.

Every man carries arms. Usually a *kiblis*, or large stabbing-spear, and often several smaller spears. Swords are uncommon, and rifles are seldom seen.

The majority still wear native grown and woven cotton called *damur*, but there is a constant demand for blue and white European cottons, especially for women's wear, as the men find the material supplied by the merchants does not wear so well as damur. The men's shirts, or *jabbas*, are made with very wide sleeves, which have to be tied up behind the neck when doing any work. The damur is all purchased at El Odaiya or Jebel Dago, none being made locally. The women own but few ornaments. Even the silver nose-ring, which every Howazama and Messeria woman wears, is by no means common. But a taste for expensive luxuries is growing, and there is no doubt that before long the necessity of gratifying female vanity will force the men to work and to trade as in less happy lands.

Living in a damp climate most of the year, and near pools and swamps full of mosquitoes, fever is very common, and as a result enlarged spleens

are often seen. A very large percentage suffer or have suffered from guinea-worm (*ferintit*), and there are a considerable number of cripples from this cause. Enlarged joints, probably due to rheumatism, are common; but elephantiasis, so common in the Nuba hills, seems to be unknown. Small-pox is described as epidemic and visiting the country at rare intervals.

As might be expected from the above account, there is but little trade in the country at present. But, in spite of the Baggara's love of doing nothing, it is increasing. Cattle and sheep are sold for horses, cottons, salt, and pepper. A certain amount of ivory is obtained by hunting, and a little is bought from the Dinkas in exchange for cows. The money in most general use is the Mejidi dollar, worth about half a crown, and the Kabashi piastre, twenty of which go to the Mejidi dollar.

A great deal of trade passes through the country, however. A road from Shakka to Nahud enters Kordofan at Muglad, and the main route from Dar Jange to Nahud is *viâ* Turda and Muglad. Merchants buy cows for the Dar Jange trade in Nahud during the rains, and take them to Muglad. When the roads are open they go south to Dar Jange, where they purchase bulls and ivory for the Khartum market, returning at the commencement of the next rains. Trade through Shakka is chiefly with Dar Fertit, and consists of cottons and beads to exchange for ivory.

There is a good deal of game in the country. In the rains elephant and giraffe must be numerous, to judge by their tracks, but in the dry season they all go to Dar Jange. Roan antelope and water-buck are fairly common. Liang are numerous, and Jackson hartebeest swarm in every ragaba. Bush-buck, reed-buck, and gazelle are plentiful, and kudu are said to be found in small numbers. Lions are common at times, but leopards are scarce.

THE RAINFALL OF THE BRITISH EAST AFRICA PROTECTORATE.

By GEORGE BRANSBY WILLIAMS.

Until within the last two or three years no effort appears to have been made to record the annual rainfall in the East Africa Protectorate in a systematic manner, but during the years 1903 and 1904 a number of new gauges were fixed, and the results are now tabulated, and, together with other meteorological information, are published annually by the Agricultural Department.

There are at the present time between thirty and forty recording stations in the Protectorate, but they are confined to the coast and a belt of country some 60 or 70 miles wide along the Uganda railway. Few of these rain-gauges have been established for any length of time, and none of the longer records are perfect from the commencement.

The oldest recording stations are Mombasa and Malindi, where the gauges appear to have been fixed in 1890. The record at Mombasa is continuous from 1891 to 1897, and from 1899 to 1905. At Malindi the figures for the years 1896 and 1897 are missing. At Kismayu and Machakos there are continuous series of gaugings during the ten years 1896 to 1905; at the latter station the rainfall was first recorded in 1894, but during the latter half of 1895 no observations were made. Amongst the other up-country stations, the records at Kikuyu and Mumia's commence from 1896, but there are gaps in both. In the whole Protectorate there are only eight stations at which observations have been made continuously for six years.

It is impossible to compile a complete and accurate rainfall map of the whole country from such imperfect data, but a careful study of the returns from all the stations enables one to sketch in the apparent position of some of the isohyetals (or lines of equal rainfall) in that part which has so far been opened up to European settlers.

Accurate statistics of the rainfall in the Protectorate are of such great importance that it is very desirable that many more rain-gauges should be fixed covering a wider area of country than at present. One of the objects of this short paper is to indicate where they could be placed to the greatest advantage.

The variations in the annual rainfall have been very considerable even during the last six years. Diagram 1 shows graphically the comparative fluctuations during the years 1900–1905 at five stations in the Protectorate, viz. Kismayu, Mombasa, Machakos, Nairobi, and Mumia's. For the purpose of comparison between the different stations, the ordinates in the diagram are plotted so as to show the rainfall for each year reduced to a percentage of the average annual rainfall for the six years at the station. The greatest variations from the average were at Kismayu, where the rainfall in 1902 was 145 per cent., and in 1903 only 47 per cent. of the average. At Machakos in 1900 the rainfall was 142 per cent., and in 1904 69 per cent., of the average.

As might have been expected, there is little resemblance between the curves at stations remote from each other, but there is a nearer relationship in the case of stations closer together, and where the climatic conditions are approximately the same. Thus, in 1903, which was a wet year at Mumia's, but a very dry year at Kismayu, it is interesting to note that, placed in order of wetness, the stations read thus: Mumia's, Nairobi, Machakos, Mombasa, Kismayu, which is the natural order. In 1902, by transposing Mumia's and Nairobi, they read the opposite way; the same applies to 1901 if Nairobi and Machakos are transposed.

Diagram 2 represents the seasonal fluctuations, and compares the average amount of rain falling in each month throughout the year at three stations—Mombasa, Nairobi, and Mumia's—representing respectively the coast, the central district, and the country round the Victoria

Nyanza. The average is taken of the same six years (1900–1905), and the result shows a marked difference in the intensity and duration of the wet and the dry seasons at the three places. At Mombasa the autumnal rains are the most marked feature; the wettest month is May, when the rainfall is three and a quarter times the monthly average. The lesser rains at the end of the year are of comparatively little importance,

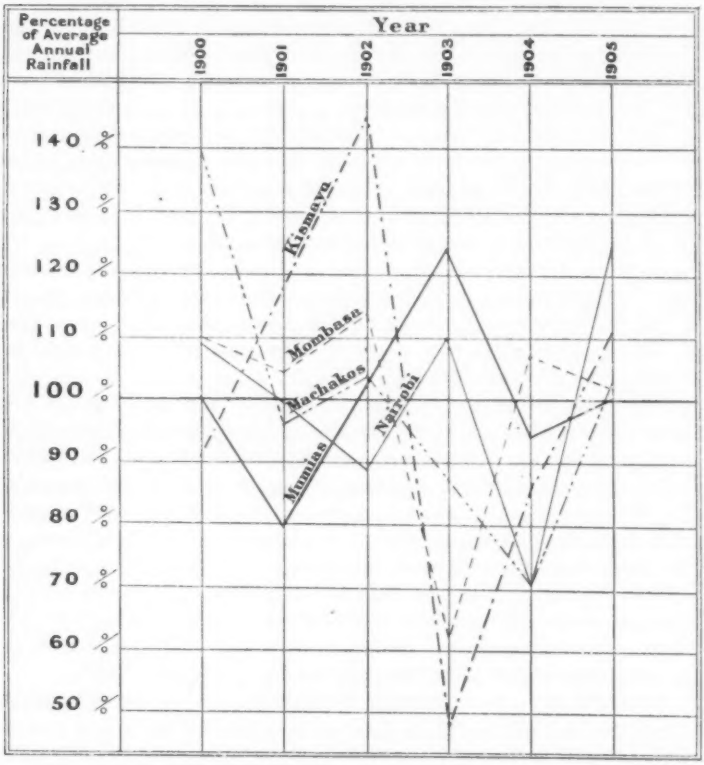


FIG. 1.—COMPARISON OF FLUCTUATIONS IN THE ANNUAL RAINFALL AT FIVE STATIONS IN EAST AFRICA DURING THE SIX YEARS 1900–1905.

November being the only month with a rainfall above the average. January and February are the driest months.

At Nairobi, on the other hand, the lesser rainy season assumes a relatively greater importance. April is the wettest month, but November and December are both wet months, December especially so, having a rainfall of 168 per cent. of the monthly average. The long dry period between June and October is much more marked than at Mombasa; but February, which is a dry month at Mombasa, is a wet month at Nairobi.

At Mumia's the rainfall is much more evenly distributed throughout the year. April and May are wet, and December, January, and February dry, but the other months do not vary much in wetness.

The rainfall, both at Machakos and at the coast stations, appears to have averaged about 10 per cent. more during the six years (1900–1905) than during the ten years (1896–1905). It is very possible that the average for these ten years in the central district is somewhat below the true mean annual rainfall, for the year 1899 was one of exceptional drought, but there does not appear to be any serious difference at the coast between the average for the ten years and for the fifteen years (1891–1905), which is as far back as we can go. For the present purposes, the average rainfall for the ten years 1896–1905 has, therefore, been assumed to be the true mean annual rainfall, wherever so long a record exists, and the shorter records have, when possible, been standardized by comparing them with this mean at other stations in the same district. Shimoni and Mombasa have been used to correct the stations at and near the coast, Machakos and Kikuyu for the central district as far as the Rift valley. In the country near the lake, the Mumia's record is the only one available for this purpose. In this the year 1899 is missing, so the average for the remaining nine years has been taken. There are some discrepancies in the rain-gauges near the lake, so the figures shown can only be considered approximate and provisional until further and more accurate information has been obtained.

The method of computing the mean annual rainfall from a short record by comparing it with a longer one at a neighbouring station is a well-known one. Although it is only of limited application in this instance, wherever it is possible to adopt it, it is likely to lead to more accurate results than would follow from accepting the uncorrected figures for the rainfall during short periods, which in some cases might lead to an error of quite 50 per cent.

The map (diagram 3) shows approximately the distribution of rainfall in parts of the Protectorate. Along the coast the rainfall diminishes fairly regularly from south to north. Between Mombasa and the German frontier there is a strip of country where the fall is over 50 inches; at Mombasa the average is 48 inches; the 40-inch isohyetal appears to cut the coast-line a few miles to the south of Malindi, the 30-inch somewhere near Lamu; whilst at Kismayu the mean annual rainfall is only 15 inches.

There is as yet no information with regard to that part of the interior of the country that lies to the north of the Sabaki river and to the east of the 38th degree of longitude. In the greater part of this country the rainfall must be extremely small. Proceeding inland from Mombasa, the rainfall diminishes fairly rapidly for about 60 miles. In the Taru desert it is under 30 inches per annum. The country to the north-east of the Uganda railway, between Makindu and Machakos,

has a rainfall of between 30 and 40 inches. On the south-west side there appears to be a fall of less than 30 inches. In all probability in the Nyeri desert there is a very small rainfall. The rainfall in the country around Kilimanjaro has not yet been determined. A gauge has recently been fixed at Taveta, which, so far as can be judged, is a dry place. The rainfall on parts of Kilimanjaro must be heavy, probably more so on the south than on the north side.

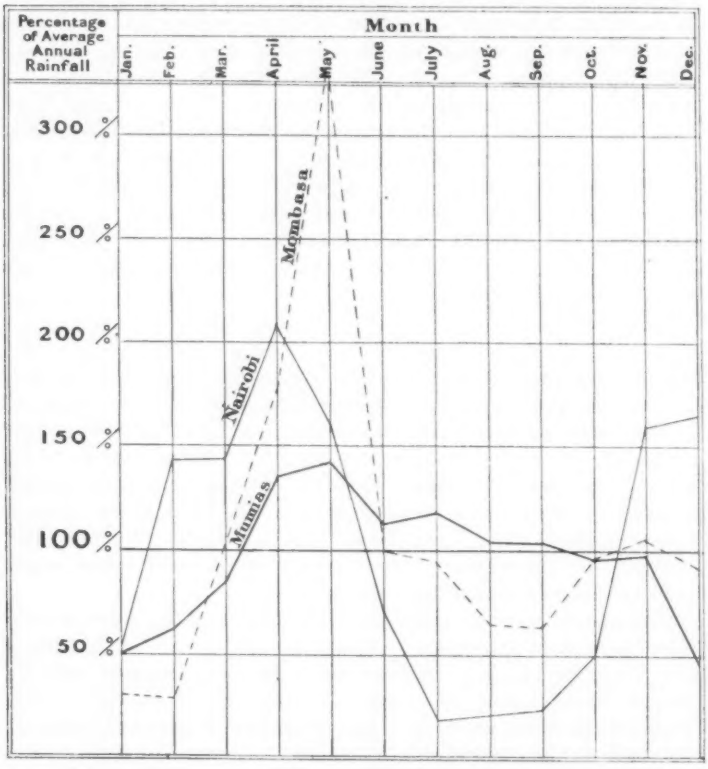


FIG. 2.—COMPARISON OF AVERAGE MONTHLY RAINFALL AT THREE STATIONS IN EAST AFRICA DURING THE SIX YEARS 1900–1905.

To the north-east of Nairobi there is a large extent of country, including both Mount Kenya and Mount Kinangop, with a rainfall of over 40 inches; and there can be little doubt that in some parts of this district the annual rainfall is very large. The Rift valley is, on the contrary, dry; the more southern portion, near Lake Magadi, has in all probability a rainfall of less than 20 inches per annum. The country between the Mau escarpment and the Victoria Nyanza is wet.

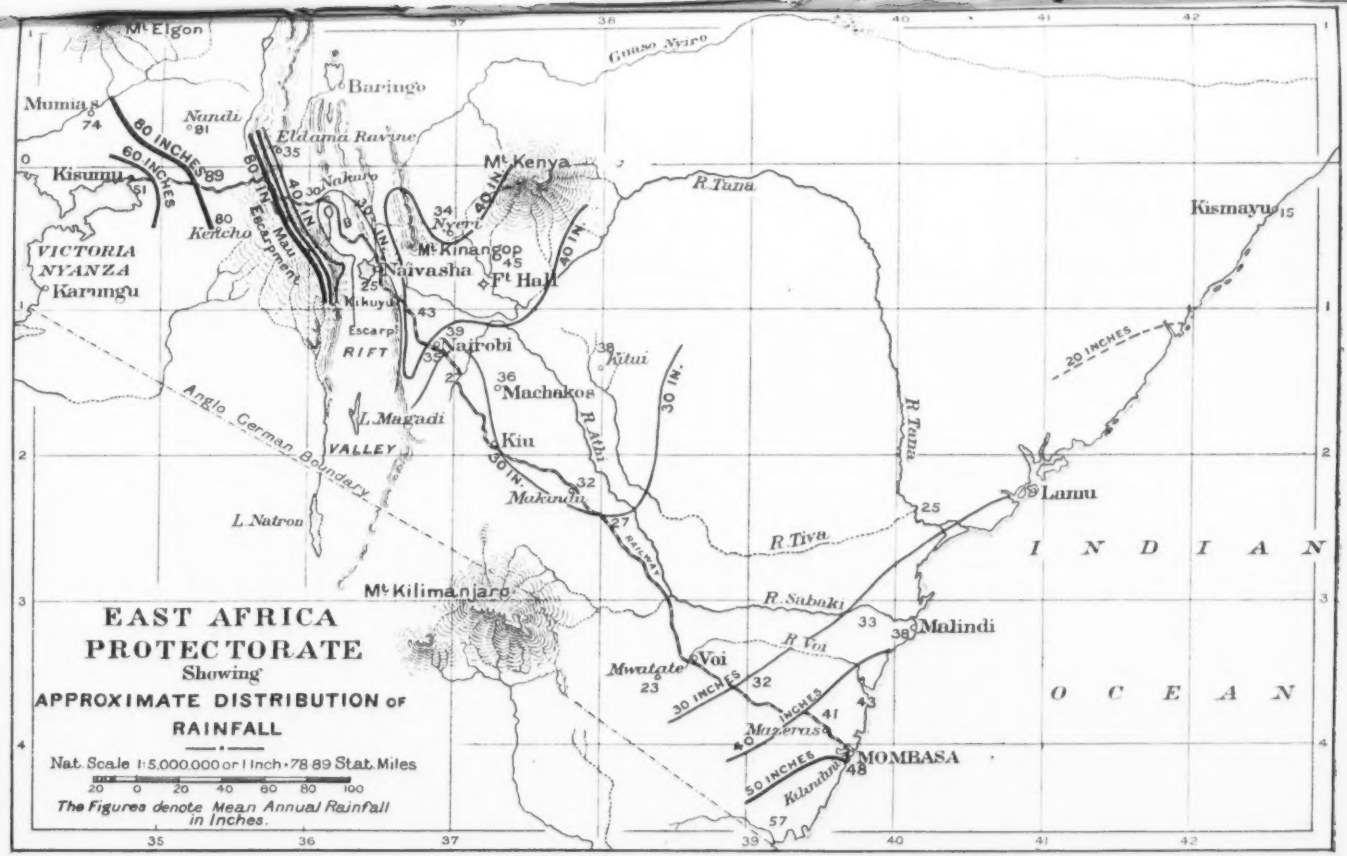


FIG. 3.—APPROXIMATE DISTRIBUTION OF RAINFALL IN BRITISH EAST AFRICA PROTECTORATE.

A large area seems to have a fall of over 80 inches, and it will not be surprising if some places in this district are found to have a rainfall of considerably more than 100 inches per annum.

Briefly, it may be said that there are three comparatively wet areas in the Protectorate—(1) a triangular strip around Mombasa; (2) the country to the north-east of Nairobi, including the greater part of the Kenya province; and (3) the district near the lake. The two latter wet areas are divided by the dry country at the bottom of the Rift valley. The actual extent of land in the Protectorate, with a rainfall of more than 40 inches per annum, cannot be determined until much fuller and more accurate information is available.

The distribution of rainfall in the district round Victoria Nyanza is still chiefly a matter of conjecture, and rain-gauges are much required along the shores in both directions from Kisumu, and also from the neighbouring mountains. There should be little difficulty in establishing a gauge at Karungu as a commencement, and as soon as the Nandi, Lumbwa, and Sotik districts are settled gauges will doubtless be fixed which will materially add to our knowledge of the distribution of the rainfall there. In the Rift valley gauges are especially required near Lake Magadi in the south, and at Baringo in the north.

In the central wet area information is necessary with regard to the rainfall on both sides of the Aberdare range, and on the slopes of Mount Kenya. At present there is no record of the rainfall at any point in the Protectorate at an elevation of more than 7500 feet above the sea. Other places where the gauges would be of scientific value would be on the slopes of Kilimanjaro, in the district between that mountain and the sea, and along the Tana river. It is impossible to expect that rain-gauges can be fixed in all these places at once, but there is no difficulty in some cases. Considering the importance from an agricultural point of view of having accurate rainfall statistics, it is much to be hoped that the Protectorate Government will greatly increase their number in the near future, and, whilst taking every opportunity of extending the area over which the recording stations are established, will also ensure that in every case the results are properly observed and recorded by an intelligent and a trustworthy person. The idea that this precaution is not invariably taken was suggested by a visit to an important station on the railway, where the gauge was found to be covered by a large flat iron plate so arranged that no water could find its way into the vessel inside. Although the time of year was at the end of the dry season, when rain was probably not much expected, this addition to the apparatus did not inspire much confidence in the observer.

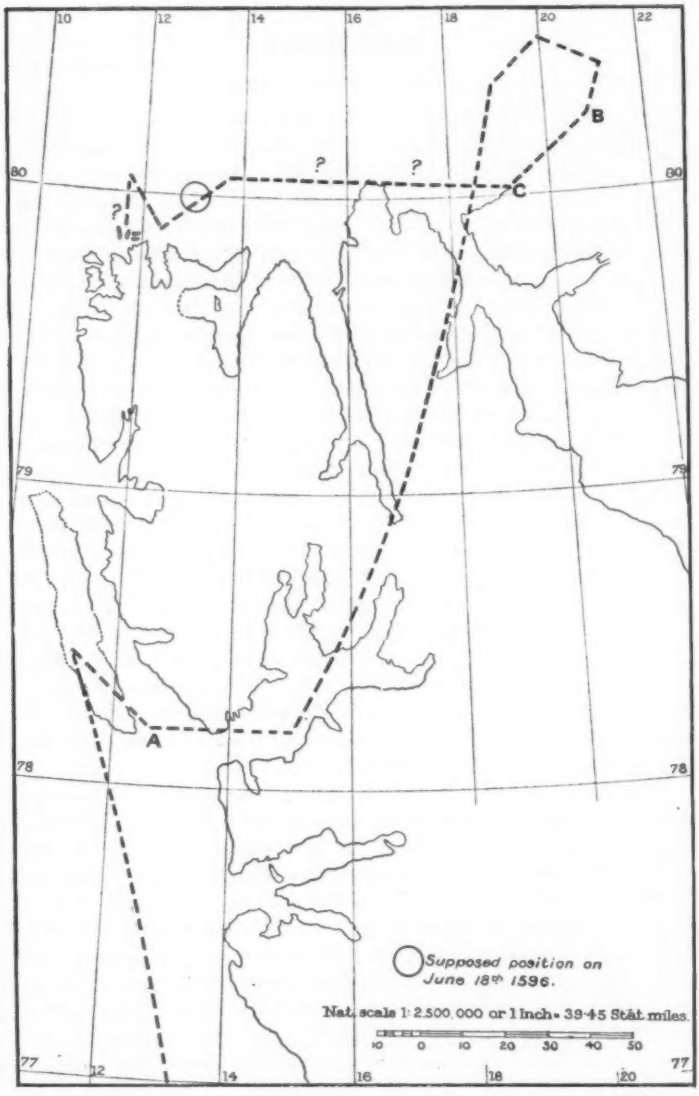
SPITSBERGEN.

By Sir MARTIN CONWAY.

In the summer of 1906 the Dutch Government sent a cruiser, the *Friesland*, to Spitsbergen. Smeerenburg was visited, and a stay of some duration made there for the purpose of putting in order the graves of the old Dutch whalers, so disrespectfully treated by visitors in recent years. They anchored in Hoeker (Virgo) bay. West of this, on the north-west coast of Danes island, they found two graveyards, whereof the one to the east belonged, according to tradition, to Frieslanders, the other to Danes. The principal Dutch graveyard was on Amsterdam island, on the east end of the north shore, and it was here that the Dutch ship *Willem Barents* set up a monument in 1878. Older than this burying-place was Deadman's island, probably only used in the earliest days of the fishery. There were also graves on the south shore of Amsterdam island, most of which were probably made after the abandonment of Smeerenburg. It was here that the captain of the *Friesland* caused all the remains to be brought together and buried in a single grave, on which a great heap of stones was piled and cemented together. Close to the still visible foundations of the Middelburg tent seven graves were discovered, probably those of the seven winterers of 1634–1635, who all died in that tent. Their skeletons also were removed to the new grave. A yet larger graveyard, containing some four hundred graves, was found on the opposite side of the bay, on the coast of the mainland. These appear to date from the eighteenth century, and to be later than the graves on Amsterdam island. One of these graves bore the date 1717. They were in good condition and unviolated, as tourists do not land there! All the names found there were Dutch.

Baron van Asbeck, who has sent us the account of the above expedition, adds some observations on matters connected with Spitsbergen history in the nature of addenda to my recently published 'No Man's Land.' The first of these is in connection with the Dutch winterings at Spitsbergen and Jan Mayen in 1633–34. It appears that in 1633 the future Admiral de Ruyter went up to Jan Mayen as mate of a whaler. In his journal, under date July 27, 1633, he notes that on this day "there came a jager (*i.e.* a ship to carry blubber, etc., to Holland) from Holland, and brought two men, one to stay on the island (Jan Mayen) with six men of the fleet to be enlisted by him, and the other to proceed to Spitsbergen to enlist there six more men. On July 29 the jager sailed for Spitsbergen with the 'burgher' (*i.e.* citizen) of Spitsbergen to stay there." These two men were evidently the leaders of the two wintering parties.

Baron van Asbeck has also been led to study carefully the recorded accounts of the voyage of discovery of Barents in 1596, when Spitsbergen



SKETCH-MAP OF SPITSBERGEN, TO ILLUSTRATE BARENTS' TRACK IN 1596.

was first seen. He finds that if the French translation of Barents' log is followed,* instead of the English translation printed in my

* Printed in S. Muller's 'Geschiedeniss der Noorsche compagnie.'

Hakluyt Society volume, 'Early Voyages to Spitsbergen,' the course actually steered by Barents' vessel can be explained. He has made out three sketches, on which he has laid down the courses, (1) according to 'Early Voyages;' (2) according to the French translation, (*a*) by dead reckoning, and (*b*) by dead reckoning corrected by the recorded observation for latitude of one point; and lastly, by (3) the track of 2 (*b*) with the positions of three known points corrected.

"The difference between the true latitudes and the dead reckoning," he explains, "shows us that from June 13 to 15 they experienced a northerly current of about $1\frac{3}{4}$ English miles an hour; from June 15 to 17 a northerly current of about 2 English miles an hour; and from June 17 (in 80° 10′) to June 18 (in 80°), having steered southerly courses for 16 miles and made 10′ south, a current of about 2 English miles an hour. The track (as drawn on the accompanying sketch) crosses the north-west corner of Spitsbergen.* It seems to me probable, not to say certain, that the current experienced was not a northerly one, but a north-westerly or a north-north-westerly, the trending of the west coast of Spitsbergen. Assuming the current to have been as supposed, with a velocity of nearly 2 English miles an hour, and that the bearing of the west headland on June 20, 1596, south-south-west 5 miles (= 20 English miles), was right, we have to fix the point *c* by computing the bearing and the current somewhere north-north-east of the Norway islands in a latitude of about 80° N."

Baron van Asbeck concludes that all the difficulties of laying down, from the recorded accounts, what was actually the course followed cannot be entirely overcome without a more exact knowledge of the currents in those parts.

ADMIRALTY SURVEYS DURING THE YEAR 1906.

By Rear-Admiral A. MOSTYN FIELD, F.R.S., Hydrographer.

UNDER the orders of the Lords Commissioners of the Admiralty, nine of His Majesty's vessels, with three small hired vessels, manned by 86 officers and 777 men, have been employed on hydrographical surveys both at home and abroad.

The Marine Survey of India, which is now in charge of an officer of the Royal Indian Marine, has been continued as in previous years.

A detailed report of Admiralty Surveys has been drawn up and presented to Parliament. The following is a brief summary:—

During the year 1906 no less than 367 rocks and shoals dangerous to navigation have been discovered, and during the same period 658 miles of coast-line have been charted, and an area of 2950 square miles has been sounded over by H.M. surveying vessels.

On the *East Coast of England*, at various places in the Medway and Thames

* Which, of course, the vessel cannot have done.

estuary, re-examinations were made of channels and reaches. The coast between Winterton and Covehithe was sounded off.

On the *South Coast*, the Portsmouth outer bar and harbour entrance were sounded out, and also a spoil ground off the Isle of Wight. A reported bank to the south-west of the Scilly islands was searched for unsuccessfully.

On the *East Coast of Ireland*, Long Island bank was resounded, and a new survey of Malahide inlet completed.

On the *coast of Scotland*, part of the Sound of Mull was resurveyed, and also Loch Snizort in Skye, while in the Orkney isles a large portion of Hoy sound was completed.

On the *coast of Newfoundland*, a triangulation was carried from Greenly island to Mekattina island, and some sounding carried out over this part.

Blanc Sablon was telegraphically connected with Ottawa observatory, and a meridian distance run to Twillingate from Blanc Sablon. Meridian distances were also determined between Bonne bay, Mekattina, and Greenly, and also between Twillingate and Bonne bay. A triangulation was carried from Cape Bauld to Canada bay. A shoal was searched for off Gull island, but a bank of 10½ fathoms only was found in this position.

On the *West Coast of Africa*, good progress was made with the survey of the coast of Liberia, and magnetic observations were obtained at various places in the Bights.

In *Borneo* the plan of Jesselton was extended north and south to Gaya head and Dumpil point respectively.

On the *China coast*, in the vicinity of Hongkong, a plan was completed from Chen Wan to Brothers point, including the Kap Sing Mun, and work in Mirs bay and near Waglan was also completed.

The coast survey between Lema islands and the Brothers has progressed, as well as a plan of Chauan bay. Port Swatow has been resounded.

In *British Columbian* waters. Port Simpson has been surveyed on an 8-inch scale, with the approaches on a smaller scale. A triangulation was carried from Port Simpson southward to Oval hill, and westward to Mount Lazaro. The triangulation from Chatham sound to Dixon entrance was extended to Cape Chacon, Alaska, and Towhill Graham island.

In *Australia*, part of the Hunter group, north-west coast of Tasmania, was surveyed, and a magnetic area near Betsy island, Storm bay, was examined. On the Queensland coast the survey was completed as far as 16° 45′ S., and the outer edge of the barrier reef on a smaller scale, including Trinity opening, between lats. 15° 48′ S. and 16° 43′ S.

In *Ceylon* the approaches to Colombo were surveyed, and the coast to the southward as far as Barberyn lighthouse completed. On the east coast, Trincomali harbour was resurveyed on an 8-inch scale.

The Marine Survey of India was responsible for a survey of the inner harbour and outer anchorage at Aden, part of the east coast of the Andamans, and a plan of the western entrance to Austin strait.

In the *Persian gulf*, the survey of Koweit was completed. A survey of the Arracan coast was commenced.

During the year the Hydrographic Department has published 116 new charts and plans, and 66 plates have had 84 new plans added to them, and 6050 corrections have been made to the chart plates.

The number of charts printed for the Government and the general public during the year was 86,868.

REVIEWS.

ASIA.

India.

'The Native Races of the British Empire: Northern India.' By W. Crooke. London: Constable. 1907. *Price 6s. net.*

'The Khasis,' by Major P. R. T. Gurdon, Indian Army. London: David Nutt. 1907. *Price 7s. 6d. net.*

The days are happily past when to the British subaltern every native of India was a "nigger." At least those subalterns whose business it is to deal with native troops are required to know something of the origin and idiosyncrasies of the men they command, and very excellent little handbooks describing the various classes of fighting troops which make up the Indian Army are published by authority and pressed upon their attention. The result is that they do know something of their men, and that military interest in Northern Indian ethnography has been greatly stimulated. The pity is that no sufficient authority exists which might insist on similar studies on the part of those in England whose business it is to intermeddle with Indian affairs and hamper the progress of Indian administration.

In Mr. Crooke's volume, at any rate, they have a book which supplies a handy reference for all the more important conditions, ethnographical and social, of Indian humanity. It is a useful book of reference even for those who know India well, and for those who wish to acquire an elementary knowledge of Indian conditions of life it is invaluable. Its elementary character is a necessity induced by its brevity. On the whole, the author has collected a large store of useful facts into a small compass, and he has marshalled his facts in an interesting and most readable manner, but still the information given must be regarded as superficial: and the criticism must be added that some of the latest additions to ethnographical literature in India have apparently not been consulted. The census reports are, rightly, the author's chief sources of information, but such valuable works as those lately published on the fighting races of India, or Mr. Dane's pamphlet on the tribes of Baluchistan, to say nothing of Indian Survey reports, do not appear in the bibliography. Nor can we agree that within the narrow limits of a book of 262 pages the relative importance of the many nationalities with which the book concerns itself has been fairly preserved.

A great deal is written—and it is most interesting—about the Dravidian tribes, and the family of Gonds looms quite large in the book. Even so, not even the Gonds are fully described, for the subdivision of the family which occupies the Godavari basin and includes such sections as the Kois and Gotturs is omitted. It is true that so little has been done towards elucidating new facts and features in the ethnography of these strange people that the author has to go back to the days of Glasfurd for his authority. On the other hand, the Gurkhas occupy but a page or two at most, and of the many varied Baluch tribes there is hardly a sketch. The influence of Arab immigration and invasion on the ethnography of North-Western India, as well as of the Afghan element within the limits of the Indian peninsula, occupies no space at all.

The later chapters of the book are all excellent, and should help greatly to dissipate the many crude notions which exist, even amongst educated people, of the relative social status of the various castes, and give, at the same time, a good general idea of the life-conditions of the people. The illustrations are good, but not always quite apropos to the text. Why, for instance, should the Bhotiya of the

Himalayas appear amongst the Rajputs? But when all is said that might be said in criticism, there is no doubt that this is a book of great educational value.

In connection with the above we may notice a book written by Major P. Gurdon, of the Indian Army, on the Khasis—the tribes of the Khasia hills in Eastern India. The Khasis have attracted ample attention from Mr. Crooke in the book referred to above, although in economic importance amongst Indian peoples they are practically insignificant.

Major Gurdon is dealing with a subject which has evidently been a life-study with him. Since the days when Woodthorpe (one of whose sketches, by the way, is amongst the book illustrations) made the first systematic surveys of the Khasia and Garo hills, no one has given us so interesting a view of this strange wild country and the yet stranger people who inhabit it. For the Kasi race is a race apart; isolated in the midst of a surrounding Tibeto-Burman population; and it presents certain remarkable features in language and institutions which have attracted the attention of comparative philologists and ethnologists for some years. Sir Charles Lyall's introduction to the book sets out the present position of scientific inquiry respecting the Khasis, whilst the book itself is an epitome of their mode of life, customs, and superstitions with a very fair series of coloured illustrations showing the eccentricities of Khasi costume.

The fault of the book is the system of arrangement, which smacks too much of a Government report. There is no personal narrative—nothing of the excitement of adventure—in the book; and yet no man could have lived amongst these people, studying their ways, collecting their folklore, and fathering their interests with the Government of India, without encountering many incidents full of the romance of untutored nature—incidents such as leave delightful memories of strange personal experience, to be recalled tenderly in the after-days of life's eventide.

T. H. Holdich.

AFRICA.

Madagascar.

'Madagascar: Studien, Schilderungen und Erlebnisse.' By Haupt Graf zu Pappenheim. *With 102 Illustrations and 6 Maps.* Berlin: Dietrich Reimer (Ernst Vohsen). 1906.

Haupt Graf zu Pappenheim's 'Madagascar' is the outcome of three years' (June, 1902, to May, 1905) residence in that island, during which time the count made a close and sympathetic study of its peoples and institutions. He went out as the agent of an English shipping syndicate; later on he prospected for gold on his own account; and afterwards acted as leader of a large French party engaged in the south of the island. He did a good deal of topographical work in the province of Farafangana, and finally returned home, his work having been stopped by a native rising, and his health having suffered from the "murderous" climate, though by far the greater part of the island enjoys a climate suitable for Europeans. The first seven chapters (pp. 1–105) are a kind of encyclopædic survey of the country; the rest of the volume (pp. 106–356) is a lively record in journal form of the author's experiences and observations in his voyages round the coast and journeys through the south-east and east central provinces of the island. Possessing a mind quick to appreciate the humorous side of things, the lighter incidents of travel are by no means neglected. At the same time the writer manages to convey much solid information—largely on the economic condition of the land—in readable form. This is notably the case in the narrative part of the volume; the information in the opening chapters is clear, precise, and concise. Sections are devoted to history, physical features, climate, health, and mining, and special attention is paid to ethnology. The family life, religion, language, music, and culture generally of

various tribes are considered, while the large number of excellent photographs of different native types add materially to the value of this part of the work. As a convenient summary of the actual condition of the island the book is of distinct service; as an entertaining record of travel it should find many appreciative readers. An English translation would be welcome, though English readers may be glad to learn that Roman type is used in the present edition. The author proves himself a good linguist and a well-read man; the errors perpetrated in some of the English names given are perhaps due to the printers. On p. 117 we notice *Richard* Louis Stevenson; on p. 251 Prof. Shutterland (for Sutherland) Black; and on the very first page of the preface Sir William Davenant (the poet) appears as Davessant.

F. R.C.

AUSTRALASIA AND PACIFIC ISLANDS.

Australian History.

'The Coming of the British to Australia.' By Ida Lee (Mrs. C. B. Marriott). London: Longmans. 1906. *Price 7s. 6d. net.*

Being a narrative of the early colonization of Australia, and dealing with the first forty years (1788–1829), when transportation was in full swing, it is remarkable that the word "convict" is seldom used—but three or four times casually, and only once when referring to the early bushrangers is it directly mentioned: "Bands of convicts, many of whom were the settlers' own servants, . . . bade farewell to authority and took to the bush."

The book is written on other lines, and concerns the work of exploration and colonization. It deals first—after mentioning the visits of Dampier and Cook—with the expedition under Phillip, its call at Botany Bay just before the arrival there of the French ships *Boussole* and *Astrolabe* under La Pérouse, and its final settlement in Port Jackson at Sydney, at Farm Cove, and what is now called Circular Quay. The work of the several governors during this period, from Phillip to Darling, the direction of their energies, their virtues, failings, and failures are recorded. Much exploration was done during the reigns of Phillip, Hunter, Macquarie, and Darling. Macquarie, following Bligh, found the affairs of the colony in a state of chaos, and set them straight. Brisbane encouraged immigration, founded the Parramatta observatory, and imported some of the best Arabs to improve the breed of horses.

There is a short *résumé* of the many attempts that were made to cross the Blue mountains, and one who has been "bushed" at the foot of their precipices can fully appreciate the final success, in 1813, of Lawson, Blaxland, and Wentworth. From the first attempt by Governor Phillip in 1788, a period of a quarter of a century elapsed before success was attained. Once the barrier was crossed, the exploration by land of the east and south-east of Australia was rapid. Many exploring parties set out from Sydney, and the magnificent country from the Darling downs in Queensland to the mouth of the Murray in South Australia became known in a few years. With this work the names of Evans, Oxley, Allan Cunningham, Sturt, Hume, Hovell, and Mitchell are connected.

Of more importance in securing the whole of Australia for the British Empire were the expeditions and voyages by sea, for the French were active, and their vessels *Géographe* and *Naturaliste*, under Baudin, were in Australian seas. Phillip, Murray, Bass, and Flinders, the last two circumnavigating Tasmania, are household names in Australian geography, and their work was done before Flinders (who had already surveyed the whole of the south coast of Australia) fell in with the French expedition in Encounter bay.

A few pages are devoted to the aborigines—their characteristics and mode of life; their weapons, fishing, corobborees, and burials; their rock carving and paintings, of which drawings are reproduced from Sir George (then Captain) Grey's work, that represent what he saw when he landed on the north-west coast. A number of old drawings of aboriginals hunting, fishing, etc., are also reproduced, as well as old portraits of the early governors.

Some of the notes on the physical features at the beginning of the last chapter must not be taken too seriously.

W. B.

Pacific Islands.

'Hawaii, Ostmikronesien, und Samoa: Meine Zweite Südseereise (1897-1899) zum Studium der Atolle und ihrer Bewohner.' Von Prof. Dr. Augustin Krämer, Marine-Oberstabsarzt. Mit 20 Tafeln, 86 Abbildungen and 50 Figuren. Stuttgart: Strecker & Schröder. 1906. *Price* 10 *marks*.

The greater part of the time during which Dr. Krämer was engaged in zoological, geological, and more particularly ethnological investigations in the Pacific was spent in Samoa, and his well-known monograph, 'Die Samoa-Inseln,' appeared in two volumes in 1902. The present volume describes the rest of his travels, to which the name "Südseereise" is scarcely applicable, for they are mainly concerned with Hawaii and the Gilbert and Marshall groups.

The author describes his journey by Chili and Peru, through Guatemala to New Orleans, and from San Francisco to Hawaii. After a few weeks spent at Hawaii and Samoa, a visit was paid to the less frequented Marshall islands, landing at Jaluit (which he notes should be Jalut). Here everything lies packed so closely together on the little patch of coral, that a few hours sufficed to see all the sights of the island. "After three hours as a globe-trotter, I could say that I had seen all that was worth seeing, and quite enough of it; as *Forscher* I recognized that a rich field of work lay before me." An interesting account of the island follows, as also of some stick-charts (which are figured) of the group. The Gilberts were next visited, and two chapters contain accounts of the islands and inhabitants of the Makin and Peru groups, in which, amongst other matters, we find descriptions of several figures of the tattoo-patterns. After returning to the Marshalls, the author sailed for the little-known island of Nauru (Pleasant island), and records its geographical and ethnographical features. The homeward route was by Sydney, New Caledonia, and Fiji to Samoa.

It would appear from these investigations that the Gilberts show a closer connection with the West Carolines, in spite of the distance between them, than with their near neighbours, the Marshalls, while the latter have distinct affinities with the Eastern Carolines. The author hopes, during his third voyage to the South Seas, in which he is at present engaged, to throw more light on this interesting point.

A. C. Haddon.

POLAR REGIONS.

The Geographical Relations of Graham Land.

J. Gunnar Andersson, 'On the Geology of Graham Land.' Bulletin of the Geological Institution of the University of Upsala. Vol. 7, Nos. 13-14, pp. 19-71, pl. i.-vi.

During the voyage of the *Jason* in 1892-94, Captain Larsen made the first serious contribution to Antarctic palæontology. His collection was small, but very suggestive. Its chief value now, however, is due to the fact that it induced Dr Otto Nordenskjöld to select Seymour island and its neighbourhood as the field of operations of the Swedish Antarctic Expedition. The work of the expedition was

interrupted by dramatic adventures, and part of the collections were lost by the wreck of the *Antarctic*; nevertheless Dr. Nordenskjöld and his colleagues secured results which will make the record of their discoveries one of the primary documents in Antarctic literature.

Reiter's application of Suess's principles to the information about Antarctica available in 1888, led him to predict that Wilkes Land would be found to be of the Atlantic coast type, and Victoria Land and Graham Land of the Pacific type. The additional information collected regarding Victoria Land has left Reiter's conclusion as to the structure of that part of the Antarctic continent still open to doubt; but the work of the Swedish Antarctic Expedition has clearly established his view as to the structure and relations of Graham Land.

The Swedish expedition explored the islands and coasts of eastern Graham Land, which proves to be an area of great geological variety and complexity. The staff was fully competent to investigate its problems, as in addition to Dr. Nordenskjöld, himself a skilled geologist, it included Dr. J. Gunnar Andersson, the present Director of the Geological Survey of Sweden. He has now summarized the geological results of the expedition in a most interesting memoir, which has been written as a preliminary sketch to guide the palæontologists, who are describing the large collections of fossil plants and animals made by the expedition.

The localities studied in detail included part of the South Orkneys, Hope bay at the north eastern end of Graham Land, and the archipelago of Ross island, Seymour island, Snow Hill island, and Lockyer island. The opposite side of Graham Land was investigated by the Belgian expedition, and the author pays a warm tribute of respect to the work of Dr. Arctowski in that less fruitful geological field. Dr. Nordenskjöld and Dr. Andersson discovered representatives of a long series of fossiliferous rocks ranging from the Jurassic to the Pleistocene; they include Jurassic (apparently Bathonian) plant-beds; the Cretaceous system is represented by the Cenomanian, Turonian, and Senonian series, and the Cainozoic by Upper Oligocene or Lower Miocene, Pliocene, and recent shell-beds. In addition to the sedimentary rocks, there are Cainozoic basalts and tuffs, and a large area of plutonic rocks, including gabbros, augite-porphyrite, and quartz diorite; the last rock appears to be the most typical, and Dr. Nordenskjöld describes it as similar to that which he had previously studied along the American coasts of the Pacific, in Alaska, and in the Southern Andes. The age of these plutonic rocks is doubtful; no evidence of their intrusion into the Jurassic was seen; but as no fragments of these rocks could be found in the Jurassic conglomerates, the author is inclined to regard them as due to a Cretaceous intrusion.

The fossils have not yet been fully worked out, but Dr. Andersson tells us enough about them to show their extreme interest, and how instructive a light they throw on the geological history of the Antarctic. The Jurassic plants include species allied to those of Australia and Gondwanaland. The Cretaceous Ammonites, according to a short preliminary note by Prof. Kilian, are similar to those of the Neo-Cretaceous of India; one horizon corresponds to the Cenomanian beds of Ootatoor, and higher horizons represent the Turonian and Senonian. Cainozoic beds, which are referred to the Upper Oligocene or Lower Miocene, remind us that the great middle-Cainozoic marine transgression on to Southern Australia is still undecided between these two dates. The new fossils include a Zeuglodon, five extinct genera of penguins, and some most instructive fossil fish. A Pliocene horizon is probably represented by the Pecten conglomerate of Cockburn island.

The main geographical interest of this memoir is its evidence as to the tectonic structure of the area. Dr. Andersson shows that Graham Land and the adjacent archipelagoes include two divisions. A broken-up volcanic and sedimentary plateau

lies along the south-eastern coasts of Graham Land; and an area of folded rocks, including Jurassic sandstones and plutonic masses, forms the axis of Graham Land, the South Shetlands, and the South Orkneys. The folded belt is shown by its composition and geological history to be a geographical continuation of the fold-line of the Andes. The eastward trend of the fold-lines of the Andes, which, as Suess has shown, is one of the most striking features in the mountain system of the southern end of South America, does not, therefore, continue far into the Southern ocean. The line is bent sharply backward round a great gulf to the south of Terra del Fuego, and passes through the South Orkneys, the South Shetlands, and Graham Land on a course to the west, along the southern margin of the Pacific. How far it continues westward, and its relations to the mountains beside the Ross sea, are still uncertain; but the Swedish Antarctic Expedition has established the essential fact of the reflection of the Andean line through Graham Land, and has filled the most important remaining gap in coastal geography by its illuminating discoveries as to the structure and history of the southern coast of the Pacific. The fossil evidence as to the life of the Southern ocean in the latitude of 64° S., at intervals from Jurassic times to the present, is also an important addition to geological and geographical knowledge.

J. W. G.

GENERAL.

Gastaldi and the Cartography of America.

Stefano Grande, 'Le Carte d'America di Giacomo Gastaldi.' Turin: Carlo Clausen. 1905. *With Facsimiles. Price 6 lire.*

Prof. Grande, who in a previous work (*Journal*, vol. 21, p. 561) did useful service in setting forth Gastaldi's general contributions to geographical knowledge, here deals in particular with the maps relating to America, which had not previously been subjected, as a whole, to systematic examination. They are considered in three groups, viz. those which accompanied the Venice Ptolemy of 1548; those prepared to illustrate Ramusio's great collection of voyages; and a number of maps issued separately. This arrangement is not strictly chronological, but is perhaps justified by the fact that the seven maps dealing in some way or another with America in the 1548 Ptolemy may be regarded as forming the first American atlas. Prof. Grande examines each map in turn, tracing as far as possible its sources, and comparing it with other contemporary maps. In many instances he is able to point to the great improvement introduced by Gastaldi as regards the extension in latitude (and sometimes also in longitude) of the countries delineated. He is perhaps inclined sometimes to exaggerate the comparative merits of his author. Thus he lays stress on the freedom displayed by Gastaldi from the fantastic notions prevalent regarding the relations of America with Asia, although the idea of a continuous land connection between the two is to be seen in all the general maps. Again, the correct representation of California as a peninsula was not an entire innovation on the part of Gastaldi, *e.g.* it is to be seen in Sebastian Cabot's planisphere of 1544. Strange to say, though generally well acquainted with previous writings on sixteenth-century cartography, the author seems to have no knowledge of the recently discovered Waldseemüller maps, which makes him attribute an original importance which they do not deserve to maps now known to be merely copied from these.

As regards the individual maps, that of South America, in the 1548 Ptolemy, is perhaps one in which Gastaldi's relative correctness is as well shown as in any, in spite of its small size. The maps in Ramusio's third volume show generally a greater elaboration than those in the Ptolemy, being based on the information supplied to Ramusio by his correspondence with Fracastoro and others. Thus the map of 'La Nuova Francia,' which embraces the coast of North America from

Florida to Labrador, embodies the information supplied by the anonymous 'Gran Capitano' of Ramusio (whom Prof. Grande, like Schefer, holds to have been Parmentier). Unlike previous commentators, Prof. Grande thinks that some knowledge of Cartier's discoveries is traceable in this. A good deal of space is devoted to the planisphere of 1546, which is certainly one of the most important of the series. The much-reduced facsimile is, however, too small to be legible, but the map had previously been shown in full size in the 'Remarkable Maps,' published by Muller of Amsterdam.

A Compendium of Geography.

'The World of To-day.' By A. R. Hope Moncrieff. London: The Gresham Publishing Company. 1905-6. Six volumes. *Maps, Diagrams, and Illustrations.*

It is a matter for satisfaction on several grounds that a work such as this should have been found worth the doing. Its title might suggest a geographical encyclopædia. It is not quite that. The sub-title describes it much more nearly—"A Survey of the Lands and Peoples of the Globe as seen in Travel and Commerce." The broad arrangement of the work is striking and wise. The flesh is separated from the bones, in this way—the text consists of a narrative account, for each country, of the features which might be supposed to interest the ordinary traveller, while in copious appendices there are furnished statistics, accompanied by many illustrative diagrams, dealing mainly with commerce, but also with other subjects; for example, we have chief rivers tabulated with their lengths, and other similar skeletonic geographical information. This arrangement leaves the narrative free of figures, which may be left alone or correlated with the text according to the inclination of the reader, and, incidentally, can be more readily revised if occasion should arise. As to the narrative, it is certainly not over-systematized in regard to arrangement, and the more serious student might cavil at some of its omissions; the author's object appears to have been to provide light descriptive reading of a popular character, with plenty of word-pictures of scenery and people, whether original or judiciously quoted. Perhaps he pursues this object a little too far; some, for example, may prefer to recognize the Empire under a more geographical name than "John Bull." It is pleasing to note, however, that information on isolated points is made accessible by a full index. As far as the work goes, then, it may be welcomed, save that in the last section, where the author moralizes briefly on the British isles, on the theory that his readers require less information here than elsewhere, we cannot pretend to find the slightest value. There is a certain archaic flavour about the scheme of maps, which includes colour-work far from worthy of Mr. Bartholomew, whose name it bears; the unintelligible but not uncommon practice of providing ordinary sketch-maps for territory also mapped more fully in colour is followed in several cases, whereas there is no attempt at systematic physical map-work even in black and white. The photographs are plentiful and well reproduced, and must have been drawn from so many sources that they form a very notable collection. A few of the coloured plates are effective; of the majority, it is only to be hoped that they do injustice to scenes which one has been taught to believe beautiful. The whole work leaves a feeling that if all concerned in it had gone a little further it might have fared very much better.

O. J. R. H.

THE MONTHLY RECORD.

EUROPE.

The Storms of February, 1907.—The following is a report from Vienna on the late destructive storms: As early as February 16 and 17 low temperatures, several degrees below freezing-point, along with high atmospheric pressure, prevailed in Central Europe. Meanwhile there passed over the north of Europe depressions of no especial intensity, bringing light west winds with rising temperature. A decisive change in the character of the weather could, however, not yet be notified. Not till February 20 did thaw fairly set in. Over Southern Sweden and its bordering seas an unusually deep depression had been reached; its lowest isobar showed 705 millimetres (27·7 inches), an atmospheric pressure of extremely rare occurrence at sea-level, the lowest hitherto observed at this level amounting to 690 millimetres (27·2 inches). Round such a minimum the wind revolves, in consequence of the Earth's rotation, in a direction contrary to that of the hands of the clock. The greater the difference of atmospheric pressure within a determinate area so much stronger the wind blowing over it. Now, on February 20 the difference of pressure between Sweden and the Netherlands amounted to 75 millimetres. This steep gradient gave rise, accordingly, on the Dutch coast, to a hurricane from the west, corresponding with the rotation round the depression lying further north. The velocity of the storm amounted to 114 to 165 feet per second, *i.e.* 68 to 97 nautical miles an hour—a velocity to be characterized, according to the scale of velocities of wind, as a "hurricane unroofing houses, throwing down strongly built chimneys, sweeping away heavy walls," etc. The storm lasted over twenty-four hours, and drove the steamer *Berlin* irresistibly against the fatal pier of the Hook of Holland. A circumstance specially fatal to the ship was the fact that the storm had been raging so long before. Owing to the situation of the minimum of atmospheric pressure, the wind came from the north and veered to the east, so that it blew in full force throughout a space of more than 500 nautical miles over an unimpeded sea. The wave-impact must, therefore, have far exceeded that of a storm of the same magnitude but wanting such accumulation of momentum. While the depression in the north was far from being counterbalanced elsewhere, a partial depression was formed on February 21 over the Adriatic, giving rise to a severe storm in the Mediterranean. To this storm, coupled with extremely hazy weather, the Austrian Lloyd's ship *Imperator* fell a sacrifice, being wrecked on the coast of Crete.

Slav and Low German Place-names in Germany.—In two recent works Herren Kühnel and Mucke set themselves the task of estimating the amount of the Slav contribution to the geographical nomenclature of the Hanoverian Wendland. In a review of these works, the *Deutsche Erde* (No. 1, 1905) highly appreciated their labours, yet observed how, from an inadequate acquaintance with the Low German geographical nomenclature, the authors had over-estimated the Slav element. A more recent article in *Deutsche Erde* (No. 6, 1906) shows how much the authors have underestimated the Low German contribution to the nomenclature of the Lüneburg localities. Following the trail of Low German in the geographical nomenclature of the Slav regions of Germany, the article further shows how notably the intrusive Low German has relabelled the localities of Slav lands. The etymology of place-names, worn down and distorted as they are, is recognized to offer a task calling for the wariest circumspection and a judgment proof against pitfalls. *Bomke* (in documents *Bombeke*), referred by the above authors to Slav *babik*, is, in fact, L.G. *bôm* + *beke* = H.G. *Baumbach*, a name of frequent

occurrence—*e.g.* in Westphalia and the Old Mark. *Lindow*, *Bernow*, *Sandow*, *Berkenow*, again, are all pure German names of wide dispersion, *ow* being but the Slav adaptation of *au*. *Rychnov* (in Bohemia) = *Reichenau*; *Plumlov* (Moravia) = *Blumenau*. With the German colonists German place-names also migrated far into Slav lands, where the names emerge with a more or less Slav twist. From fifty to one hundred family names is all the legacy left by the Wends in the nomenclature of Mecklenburg. On the Saale and east of it numerous Low German colonies have imposed German names on Slav territory. Halle (salt works) is a Low German name occurring ten times in Westphalia. *Brandenburg*, carried back in Meyer's 'Conversations-Lexicon' and in Carlyle's 'Frederick,' to the Wendish Brennabor (a name, too, stamped on cycles made in Brandenburg), is shown to be of purely German origin. "Brambor" is but a Slav transformation of Brandenburg.

Historical Atlas of the Alpine Provinces of Austria.—This atlas, which owed its inception to Eduard Richter, has now entered on publication under the auspices of the Imperial Academy of Sciences in Vienna. The part already to hand shows how valuable will be the cartographic work, not only for historical research, but likewise for the solution and study of questions in the province of political as also of cultural geography. The first division of the whole work will be devoted to the representation of the historical development of the boundaries of the jurisdiction of the Supreme Court, and is to comprise thirty-seven maps, eleven of them are now out, embracing the provinces of Salzburg, Upper Austria, and Styria. The maps, which have been prepared by the Vienna Military Geographical Institute, conform to the plan of the general map of Middle Europe, and are therefore on the scale of 1 : 200,000. The ground is shown by means of hachures in brown; rivers and lakes in blue; places and letterpress black; the frontiers in black and red. An elucidatory part is added, the introduction to which is from the pen of Eduard Richter himself. To him is also due the elaboration of the maps of Salzburg, with the division into provincial courts, and the accompanying elucidative text. Oswald Redlich, who has been elected superintendent of the Academic Atlas Commission in succession to Richter, concludes the introduction. The cartographic work differs essentially from the great mass of historical atlases or maps. Instead of presenting the situation at a particular moment of the past in the politico-administrative development of the land, it brings to view, always in one representation, the provincial court distribution in its transition from mediæval to modern times. Occasionally it gives, simultaneously, a representation of the situation towards the end of the eighteenth century, down to which time the old conditions had pretty fairly maintained themselves. It is only since the time of the Emperor Joseph II. —in Salzburg since 1803—that dislocations of greater moment have taken place. In this atlas the ground is regarded as a feature to be kept in view throughout. "Even in the smallest patch represented," says Richter, "the student should be able to form for himself a notion of the character of the spot of earth he sees before him." The frontiers as they stood towards 1800 are brought out in red print. Of place, river, and mountain names, only such are taken into account as were of importance for the development of the provincial courts and of the "Bourgfriede" (jurisdiction in and around a castle). The "Territories" of the princely dynasties of the later Middle Ages are constituted of such provincial courts. A characteristic of their development from the thirteenth to the eighteenth century is their successive diminution through division. The next part of the work will present the development of the ecclesiastical distribution of the Austrian Alpine lands.

ASIA.

Prof. Huntington on Lob Nor.—We alluded briefly, about a year ago, to Prof. Ellsworth Huntington's visit to the Lob Nor region, during which he for the first time crossed the whole width of the desert plain to the east of the present position of the lake. A graphic account of the journey, followed by a discussion of the problem of the physical history of the lake-basin, has appeared in the *Bulletin of the American Geographical Society* for February and March, 1907. It will be remembered that the journey involved considerable risks and hardships, being made in the depth of winter, with a temperature frequently many degrees below zero Fahr., while to the scarcity of fuel and water-supply (for the latter it was necessary to load the camels with blocks of ice dug out of the marshes) was added the exceedingly difficult nature of the ground. The whole plain was seen to be merely the ancient bed of a much more extensive lake, and its surface was largely composed of salt deposits, the surface being likened by Prof. Huntington to the choppiest sort of sea with white caps a foot or two high, frozen solid. Sometimes the salt took the form of pentagonal prisms, from 5 to 12 feet in diameter. The old Chinese tales of bottomless mire, in which horse and rider might totally disappear, received some confirmation, the plain occasionally forming hollows where the soil was damp and comparatively smooth, which it was risky to venture over. On one occasion the camel which the traveller was riding broke through the saline crust, and sank a yard deep into soft oozy muck, being extricated only with difficulty. On the northern border of the basin, the surface displayed an alternation of æolian "mesas" of clay (in the form of elevated peninsulas or elongated islands), with bays and sounds of similar dimensions, all with their axes running north-east and south-west. Prof. Huntington regards the hollows as having been carved out by the wind during a dry epoch preceding the last marked expansion of the lake. Elsewhere the party travelled over a fantastic red plain—the soft, dry bed of an older expansion of the lake—glittering with gypsum crystals, and sparsely studded with mesas of pink and greenish clay. For 100 miles the only signs of life in the whole plain had consisted in a plover, half buried in the salt, and dead for centuries, and the deeply buried roots of some reeds which must have flourished in the expanded Lob Nor of one of the Glacial epochs. As regards the past history of the region, Prof. Huntington takes a view differing from those both of Prjevalsky and Hedin, though containing elements of both. The existing Kara-Koshun swamp is, he thinks, the small modern remnant of a large ancient Lob Nor, but between the third and eighth centuries of our era the lake seems to have occupied the position assigned to it on old Chinese maps, about a degree north of Kara-Koshun. In travelling round the basin, Prof. Huntington found that it is surrounded by terraces and by deposits which show an alternation of aqueous and sub-aërial conditions, which, in conjunction with similar phenomena noticed both in Turfan and Seistan, indicates, in the writer's opinion, that the climate of recent geological times has been much more variable than is generally supposed. Six different lacustrine strands were found, lying at varying levels above the modern Kara-Koshun. The change in the position of the lake seems rather due to changes in the course of the Tarim than *vice versâ*. Unlike Hedin, Prof. Huntington believes that in the Middle Ages Lob Nor was decidedly larger than now, and he points to the existence of two old roads, skirting the abandoned shore, which involve a two days' waterless journey, and could hardly have been used if the shorter modern route had been practicable.

AFRICA.

Altitude of Khartum.—During the last eighteen months a duplicate line of levels has been carried from Khartum to Wadi Halfa in connection with the survey

of possible reservoir sites in this reach of the Nile. The altitude of Khartum above mean sea-level at Alexandria may be taken as 382 metres (1252 feet). The actual results are—

Place.	Metres above sea-level.	Authority.
Zero of Nile gauge, Wadi Halfa	116·70	Willcocks.
Bench mark at Abu Fatma	230·70	Survey Department.
Bench mark at Jebel Barkal	256·59	" "
Bench mark at Abu Hamed	310·79	" "
Top of Berber gauge	346·95	" "
Zero Khartum gauge	364·37	" "

The zero of the Khartum Nile gauge is about 10 metres below mean low stage, and the mean range of the flood is about 5·5 metres, so high and low flood-level at Khartum are about 374·4 and 380·9 metres above sea-level. The bank-level is about 382 metres above sea-level. Bench marks were fixed every 10 kilometres, and the values of these, together with their descriptions, will shortly be published.

The Climate of Eritrea.—An article in the *Rivista Coloniale*, a new Italian periodical treating of colonial questions, sums up in a useful way our knowledge of the climatic conditions of the Italian possession on the Red sea. Its author is Captain Tancredi, who explains the varying climatic conditions of the several parts of the territory as resulting from their position or relief. The data for the study consist of observations from fourteen different stations, mostly dating only from the last few years, though in the case of Massaua and Kassala there are unbroken series extending over ten and eight years respectively. The writer points out that the division of zones of altitude corresponding to the popular usage in Abyssinia, the limits of which were laid down by Dove in his work on the climate of that country, will not hold for Eritrea, owing to the marked difference between the seaboard strip up to about 500 metres (1650 feet) (the Samhar of the natives) and the zone immediately above it. His main divisions, therefore, are (1) the coast zone, (2) the zone of the valleys and escarpments, (3) that of the high plateau and alpine summits. In the first the conditions are extremely trying to Europeans by reason of the great heat and atmospheric humidity, the latter reaching its maximum in the months of June, September, and October. As a rule rain falls in the winter months only (November to April). The second zone falls within the *régime* of summer monsoon rains, but those portions which adjoin the coast zone enjoy the benefit of some winter rains as well. This makes it necessary to subdivide the zone according as the slopes face the sea-board or the Sudan. The soil is fertile, and the water-supply renders vegetation both rich and varied. In the seaboard subdivision the most diverse products are capable of cultivation, according to altitude, but the conditions cannot be said to be favourable to European settlement. On the continental slopes of this zone, which form about three-fifths of the whole area of Eritrea, the climate is more propitious owing to the comparative dryness and greater variations of temperature due to nocturnal radiation. May is here the hottest month, and August the most rainy. The lower levels have a less copious rainfall, but as a set-off to this the possibilities of irrigation are greater, as the streams, which at higher levels flow far below the surface, here emerge on to less permeable strata. The third zone, above 1900 metres (about 6250 feet), includes only a small portion of Eritrean territory, within which the highest altitude is about 3100 metres (10,000 feet), and the highest permanently inhabited spot about 2600 metres (8500 feet). The bulk of the rainfall falls in summer (monsoon

rain), but a certain amount also falls in early spring. The greatest heat occurs in the dry season (November to May), during which vegetation rests, especially above 2400 metres (about 7850 feet), at which level the zone may be divided into two sub-zones of somewhat different character. The article gives full details as to average or extreme temperatures, rainfall, *régime* of the winds, etc., within the several zones.

The Frontier between the Kamerun and French Congo.—The surveys for the delimitation of this frontier, which has engaged the attention of the two Governments concerned for some years, have now been completed, the two commissions which went out in 1905 to work on the eastern and southern portions respectively, having lately completed their labours. They were not the first to take the matter in hand, for in 1900–1902 the precise determination of positions at the two extremities of the southern part of the frontier was effected by the joint commission under Captain Engelhardt and Dr. Cureau, the cartographical results of which were for the first time fully described by Prof. Ambronn in the *Mitteilungen aus den Deutschen Schutzgebieten*, 1906, No. 3 (see also a summary by Max Moisel in *Globus*, vol. 90, No. 18). The chief work done by this commission was the determination of the points at which the boundary cuts the 10th and 15th meridians east of Greenwich, and of the precise parallel of latitude on which the course of the Campo intersect the 10th meridian, this parallel forming the southern boundary of the Kamerun for the greater part of its length. Valuable topographical surveys were also carried out, but no attempt was made to demarcate the frontier where formed by the above-mentioned parallel, which worked out as 2° 10′ 20″ N. The immediate occasion for the resumption of the surveys was the conflict which took place on the eastern frontier regarding the ownership of the village of Missum-Missum, and it was at first contemplated to survey only the southern portion of that frontier, from the Sanga to Kunde. The operations were, however, extended so as to embrace the survey of the whole frontier, both on the east and south. In the former direction the chief commissioners were Commandant Moll (on the French side), and Baron von Seefried (acting for Germany); in the latter, Captain Cottes (French), and Captain Förster (German). Some account of the work of the French parties (which went out together to Wesso on the Sanga, there separating for their respective tasks), is given in the *Questions Diplomatiques et Coloniales*, April 1 and 16, 1907. In the case of the eastern Kamerun frontier, some difficulties were experienced when the northern section was reached, inhabited as it was by natives who had hardly at all been brought under European influence. In particular the passage from the region of manioc to that of millet involved difficulties by reason of the unwillingness of the inhabitants to pass, as porters, from one to the other. The physical character of the two regions differed, the millet country being badly supplied with water, while small-pox was rife in it. But Lake Chad was eventually reached in safety. The work of the commissions has produced valuable results as regards the general knowledge of the country, its people and productions, and much light has been thrown, in particular, on the hydrography of the northern part of the Ogowe basin and adjacent areas to the north, previously known more or less vaguely from the work of Crampel, Fourneau, Lesieur, and others.

AMERICA.

Areas of the United States.—To do away with the discrepancy between the statements published in 1881 by the Census, and 1899 by the General Land Office, as to the areas integral and divisional of the United States, three officials, representing these two offices and the Geological Survey, have, after some months' collaboration,

arrived at an identical determination published in *Bulletin* No. 302 of the United States Geological Survey. This gives the United States proper a total land area of 2,974,159 sq. miles, or $\frac{3}{1000}$ (1188 sq. miles) more than the Census Office's estimate in 1881. Including water surface and outlying possessions, the total area amounts to 3,743,344 sq. miles. Area computation, however, involves questions of inclusion or exclusion of bays and estuaries, coastal sea-strip, and strips of the great lakes. The boundaries of a few of the States, again, have not yet been accurately mapped, and the situation of the coast-line of Alaska is still imperfectly known. Subject likewise to such modification as more accurate charts may call for, are the areas set down for the Philippine islands, Guam, Samoa, and the Panama canal strip. Nor does the total area above given take account of the claims of the States bordering the great lakes to shares in their waters. Approximate estimates of such shares are separately tabled. Nor does it include the claims of California and Oregon to jurisdiction over strips of Pacific waters, nor of Texas to jurisdiction over a strip of Gulf water.

Earthquake in Mexico.—At about 11.30 p.m. local time, or about 6 a.m. Greenwich time, on April 14 last, a very severe earthquake was experienced over the greater part of Mexico. The earliest accounts reported an interruption of railway communication between Mexico city and the east coast, and it is not impossible that there may have been a minor centre of disturbance in this region. No further confirmation of this report has, however, appeared, and the fuller details which came in later showed that the centre of violence and destruction lay along the west coast from Acapulco to Salina Cruz, a portion of the former town having been submerged. The principal focus seems, therefore, to have been submarine, in a region where seaquakes are common, and not infrequently reported by ships, though not felt on shore. The shock was severe, but not severe enough to cause damage, at San Luis Potosi and Juan Batista, cities which lie about 500 miles apart and 350 miles from the region of greatest violence; from this it is probable that the area over which the shock was, or could have been, felt, extended to some 500 miles from the centre. After making every allowance for irregularity in the outline of the seismic area, this must have reached an extent of 125,000 to 150,000 square miles.

Currents in the Gulf of Mexico.—The exact *régime* of the circulation of water at the fountain head of the Gulf Stream in the Gulf of Mexico seems only recently to have been thoroughly elucidated. During the last two or three years an effort has been made, under the direction of Lieut. J. C. Soley, chief of the New Orleans branch of the United States Hydrographical Office, to obtain more accurate data from the captains of ships, who were asked to keep a record, during their voyages across the gulf, of the ship's position, direction and strength of the wind, direction and strength of the current, and of the temperature and colour of the water. Lieut. Soley has communicated the preliminary results of this investigation to the *Annalen der Hydrographie*, 1907, pt. 2. He says that on plotting the data in a series of monthly charts, a surprising agreement was shown between those obtained from various sources, so that he is able to sketch the *régime* of the circulation with some minuteness. As is well known, the Gulf of Mexico is a deep basin, filled in the centre with cold water, and communicating with the ocean by two comparatively narrow channels. On entering this basin by the deep Yucatan channel, the water of the equatorial current divides into three branches, the most important of which makes a sweep to the west, north, and east, round the inner side of the basin, before making its exit by the Florida strait. The stream follows a well-defined course determined by the sudden, almost wall-like drop of the gulf-floor between 100 and 1000 fathoms. Except under special conditions, the current

does not affect the water where shallower than 100 fathoms. Of the other branches, one flows direct to the Florida strait in a north-easterly direction, while the other flows north and north-west, joining the main branch off the mouth of the Mississippi. There are two main counter-currents, the one flowing east along the north coast of Cuba, the other west from the Mississippi's mouth, between the main current and the north-west shore of the gulf. In the centre and west of the gulf, there are two areas of virtually still water, marked by a low surface temperature. Lieut. Soley points out that there are no true tides in the gulf, changes of level being brought about by wind-action. This is able to temporarily change the rate or direction of the current; thus a northerly gale causes the main current to flow over the Campeachy bank and close to the Mexican shore. The effect of the seasons is also noticeable, the course of the currents sketched above being what may be called the normal one, which suffers disturbance during the hurricane months from September to November. The effect of high water in the Mississippi in April and May is to increase the strength of the westerly counter-current, while the flood-water from the South Pass joins the main current and causes it to bend to the south-east. The water of all the rivers which enter the gulf tends to be deflected to the right, causing the formation of sandbanks on the west or south of their mouths. The writer attributes all the currents to differences of density, and lays stress on the fact that the water always seeks the path of least resistance.

AUSTRALASIA AND PACIFIC.

Journey across Western Australia.—An interesting journey north-eastwards across Western Australia, through the country known as Gibson's desert and the Great Sandy desert, was made in the latter half of last year by an official expedition under Mr. A. W. Canning, of the West Australian Survey Department. A detailed itinerary and report on the results of the journey appear in the *Western Mail* of April 6. Mr. Canning's instructions were to try to map out a practicable stock route between the eastern goldfields of Western Australia and the pasture-lands of the Kimberley division in the north. With a number of assistants, and twenty-three camels and two horses, he set out from Wiluna, in the East Murchison goldfield, at the end of May, 1906, and completed the traverse of the desert without mishap after a journey of several months. Proceeding by way of Lake Naberu, Lake Disappointment, and Godfrey's tank (the position of which is reported to be wrongly indicated on the maps), the party eventually reached a pool in Sturt's creek in 19° 53′ 52″ S. lat. From here they continued up the creek, making a careful compass traverse as far as its junction with the Wolf, and finally crossed over from Flora valley to the telegraph station at Hall's creek. Mr. Canning reports that in and near the Sturt there is a great deal of good pastoral country; in fact, the country is described as good all the way. Much of it is typically Australian, and Mr. Canning makes frequent reference to sandhills, mulga scrub, and spinifex. He declares, however, that the amount of water found in the centre of the desert at a shallow depth was a revelation to him, and he has every confidence that a well-watered stock route can be marked out from Wiluna to Sturt's creek, providing fair feed for travelling cattle over a considerable portion of the distance. The natives encountered during the journey were of great assistance to the expedition, readily pointing out existing sources of water-supply. According to native accounts, the season was exceptionally dry, and Mr. Canning's experience of the practicability of the route is therefore the more noteworthy. All the camels and horses completed the journey, and were in fair condition at the end. Plans of the route have been plotted upon the scale, both of 1 inch to the mile, and 1 inch to 300 chains; and on the return journey, Mr. Canning—whose report is dated January 10, and was sent to

Perth by sea—hoped to be able to explore more of the country on either side, with a view to determining precisely the best line for the proposed stock route.

German Surveys in the Western Pacific.—Results of great interest as regards the morphological features of the Western Pacific have been obtained from extensive series of soundings taken in connection with the laying of submarine cables from Menado in Northern Celebes to Yap and Guam, and from Yap to Shanghai. The observations have been worked up at the German Hydrographical Office, and issued in its publication entitled *Aus dem Archiv der Deutschen Seewarte* (Jahrg. 29, Heft 2, 1906), while a *résumé* of the results has appeared in the *Annalen der Hydrographie* (1907, Heft 3) from the pen of Prof. G. Schott, one of the authors of the larger memoir. The soundings numbered 675 in all, and were not restricted to the direct lines joining the places named, but covered a zone with a breadth, in places, of over 50 nautical miles. A good deal of light has therefore been thrown on the configuration of the ocean floor, which proves to be astonishingly complex in this region, though a certain regularity may be traced in the very variety of the relief. The most striking feature is the existence of a series of deep troughs, running in more or less parallel directions, and occurring regularly on the outer or oceanic side of the principal groups of islands—the Liu-kiu, Marianne, Pelew, and Talau islands (the last lying to the north-north-east of Celebes). Prof. Schott gives a table summarizing the morphological features brought to light as regards the width of the lines of elevation and depression, the angle of the slopes between them, and so forth. He points out that there is a regular succession from west to east of island, trough, and horst, ending in a renewed though more gradual fall to the general oceanic depths. The term "horst" is adopted by reason of the apparent analogy with the geological feature so named, and the writer considers it highly probable that the morphology of the region is due to a great series of dislocations, such as might be expected to occur on the outer margin of a continental mass. It is not quite clear whether the island groups themselves are also to be regarded as horsts, the term being actually applied only to the areas with relatively shallower water which immediately follow the deep troughs as we proceed from west to east. An inspection of the bathymetric charts annexed to the paper seems to show, however, that these shallower areas in each case represent the tailing off, to the south, of the next outer line of islands, the most pronounced portions of the successive elevations and depressions occurring, not in a direction at right angles to their own trend, but, as it were, *en échelon*. The more gradual angle of slope in the case of the horsts (which would seem to be one, at least, of Prof. Schott's reasons for differentiating them from the above-water portions of the surface) would thus be a natural accompaniment of the lower altitude of these parts of the lines of elevation. In every case the steepest submarine slope is that immediately preceding the trough as we proceed to the latter from the side of the island. But even here the average only reaches $8\frac{1}{2}°$ (or 1 in 6·7), though a maximum of 18·6° (or 1 in 3) occurs in the case of the Yap trough.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Influence of Surface Waters on Ground Water.—It is a disputed question how far streams or other surface waters may influence the conditions of the ground-water stratum in the districts in which they occur. The question is of some practical importance, inasmuch as, if the level of the ground water can be shown to be in any great measure dependent on neighbouring streams, any diversion of the latter or diminution of the amount of water carried may injuriously affect the wells of the district. Such a case lately occurred near the shores of the Lake of Constance, where the level of the water in wells seemed to be lowered in consequence of the

does not affect the water where shallower than 100 fathoms. Of the other branches, one flows direct to the Florida strait in a north-easterly direction, while the other flows north and north-west, joining the main branch off the mouth of the Mississippi. There are two main counter-currents, the one flowing east along the north coast of Cuba, the other west from the Mississippi's mouth, between the main current and the north-west shore of the gulf. In the centre and west of the gulf, there are two areas of virtually still water, marked by a low surface temperature. Lieut. Soley points out that there are no true tides in the gulf, changes of level being brought about by wind-action. This is able to temporarily change the rate or direction of the current; thus a northerly gale causes the main current to flow over the Campeachy bank and close to the Mexican shore. The effect of the seasons is also noticeable, the course of the currents sketched above being what may be called the normal one, which suffers disturbance during the hurricane months from September to November. The effect of high water in the Mississippi in April and May is to increase the strength of the westerly counter-current, while the flood-water from the South Pass joins the main current and causes it to bend to the south-east. The water of all the rivers which enter the gulf tends to be deflected to the right, causing the formation of sandbanks on the west or south of their mouths. The writer attributes all the currents to differences of density, and lays stress on the fact that the water always seeks the path of least resistance.

AUSTRALASIA AND PACIFIC.

Journey across Western Australia.—An interesting journey north-eastwards across Western Australia, through the country known as Gibson's desert and the Great Sandy desert, was made in the latter half of last year by an official expedition under Mr. A. W. Canning, of the West Australian Survey Department. A detailed itinerary and report on the results of the journey appear in the *Western Mail* of April 6. Mr. Canning's instructions were to try to map out a practicable stock route between the eastern goldfields of Western Australia and the pasture-lands of the Kimberley division in the north. With a number of assistants, and twenty-three camels and two horses, he set out from Wiluna, in the East Murchison goldfield, at the end of May, 1906, and completed the traverse of the desert without mishap after a journey of several months. Proceeding by way of Lake Naberu, Lake Disappointment, and Godfrey's tank (the position of which is reported to be wrongly indicated on the maps), the party eventually reached a pool in Sturt's creek in 19° 53′ 52″ S. lat. From here they continued up the creek, making a careful compass traverse as far as its junction with the Wolf, and finally crossed over from Flora valley to the telegraph station at Hall's creek. Mr. Canning reports that in and near the Sturt there is a great deal of good pastoral country; in fact, the country is described as good all the way. Much of it is typically Australian, and Mr. Canning makes frequent reference to sandhills, mulga scrub, and spinifex. He declares, however, that the amount of water found in the centre of the desert at a shallow depth was a revelation to him, and he has every confidence that a well-watered stock route can be marked out from Wiluna to Sturt's creek, providing fair feed for travelling cattle over a considerable portion of the distance. The natives encountered during the journey were of great assistance to the expedition, readily pointing out existing sources of water-supply. According to native accounts, the season was exceptionally dry, and Mr. Canning's experience of the practicability of the route is therefore the more noteworthy. All the camels and horses completed the journey, and were in fair condition at the end. Plans of the route have been plotted upon the scale, both of 1 inch to the mile, and 1 inch to 300 chains; and on the return journey, Mr. Canning—whose report is dated January 10, and was sent to

Perth by sea—hoped to be able to explore more of the country on either side, with a view to determining precisely the best line for the proposed stock route.

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diversion of a portion of the water of the Bregenzer Ach. This led Prof. Kastner of Salzburg to make a careful investigation of the subject, both by observations on the spot and by means of laboratory experiments, and the results have been put forward in a paper of some length printed in the *Mitteilungen* of the Vienna Geographical Society (1906, Nos. 11 and 12). It is impossible to describe in detail the methods employed by Prof. Kastner or the somewhat complex discussion of the physical principles involved. Having first proved to his satisfaction that the river water does percolate through the deposits over which it flows, and that these are not, as is often held, rendered impermeable by the mud laid down on the river-bed, Prof. Kastner studied the probable action of the river water on the ground water by means of experiments with glass tubes, partially filled with river sand, through which a constant stream of water was permitted to flow. In this way he was able to elucidate the possible action of the river water in pounding up the ground water by means of the pressure exerted by it through the permeable deposits, and further light was thrown on this action by a study of the conditions under which the water of one stream is held up by that of another. Direct observation on the ground proved without a doubt that a definite relation exists between the river water and ground water, the fluctuations of level of the two being in almost complete agreement. It was ascertained that, as regards chemical composition, the wells nearest the river showed a somewhat closer agreement with the latter than those at a greater distance, and this would seem to favour the view that the action is that of direct filtration. Prof. Kastner shows, however, that there are important reasons for inclining to the opinion that the rise in the level of the ground water may be due, in part at least, to impounding as a result of pressure. He concludes by pointing out the practical importance of recognizing how deleterious matters contained in the soil may in this way be brought up to the surface and favour the spread of disease.

Stereoscopic Colouring of Maps.—That the progress in map making, due to the attainment of a plastic effect by means of colours, is comparable to that brought about in the case of landscape pictures by Wheatstone's stereoscope, receives unexpected support from investigations, of which Dr. Eduard Brückner, Albrecht Penck's successor in the geographical chair at Vienna, is about to publish an account. Careful researches have lately been made by his brother, ophthalmologist at Würzburg University, into the phenomenon, known even to the ancients, by which certain colours appear to stand out in front of others, *e.g.* the reddish before the bluish colours in the spectrum, and these researches have established the fact that the appearance rests on a physiologico-optical process strictly analogous, *mutatis mutandis*, to stereoscopic vision. It has hitherto been assumed that the phenomenon of outstanding and receding colours was monocular, to be interpreted as a phenomenon of accommodation on the part of the single eye due to the dispersion of colours in its lens, which, unlike the lenses of our photographic cameras and telescopes, is not achromatic. But Brückner demonstrates the binocular character of chromato-stereoscopic vision. It was in Vienna that the endeavour to give a plastic representation in maps by means of colours first found expression, both in theory and practice, for as early as 1830 Ritter von Hauslab attained the desired end by using series of colours arranged according to the degree in which they presented the appearance of rising or falling relatively to the datum plane of the picture. In 1842 he put forward his idea before a scientific assembly in Graz. The law of colour-representation ran: "the higher the darker," analogous to the well-known rule "the steeper the darker" in Lehmann's system of hachures for military maps. It was in 1898, once more in Vienna, that this artificial rule gave place to the natural law of advancing and receding colours, the effect of which is, moreover, considerably accentuated by "adaptation," *i.e.* the contraction of the pupil in viewing vivid, its dilation in viewing

dull, colours. The precise scale adopted by the younger school of cartographers in Vienna for hypsometric representation therefore employs pigments in the order of the spectrum, from blue-green to orange-red, but with an abatement of brightness and intensity in the individual tones proportional to the depth of the area represented. The low-lying areas are accordingly shown by a pale or dull blue-green (grey-green), whence the land rises through pale yellowish-green and yellow (chamois) to brownish and red-brown, culminating in a vivid brownish-red. A characteristic of this chromatostereoscopic effect is that it at once admits of combination with a system of shading, whether with oblique or with perpendicular illumination. The latter presents the forms, the stereoscopic colouring the distribution of the forms in a vertical direction or as regards the elevation above sea-level. What strikes one, on looking into the stereoscope, as specially novel—the immediate visuality of three-dimensional space—is similarly effected by exact chromatostereoscopy used in conjunction with the traditional hatched or tinted shade-picture of our land-maps. The geographical forms are presented as distributed in geographical space, and the maps are developed into three-dimensional pictures. With the precise formulation of the above theory, the terms "Schattenplastik" and "Farbenplastik" have been adopted, as watchwords of the latest phase of cartography, not only in Vienna, but in Austria-Hungary, Germany, and Switzerland. As in the case of every achievement which has attained precise scientific determination, chromatostereoscopic cartography can look back on a long preparatory stage of intuitive, not reflective, endeavour, undirected by any conscious groping after natural laws. The culmination of this stage is to be found in modern Swiss cartography, which thus arrived at a partial application of determinate colour-tones somewhat earlier than the theory of a chromatostereoscopic representation was formulated at Vienna; and it is of interest to observe that it was under the stimulus of these artistic maps (though *subsequently* to the formulation of the colour-code by the Vienna school) that Brückner was led to his new theory of chromatostereoscopic vision. To appreciate the new advance in cartography, we way compare the Swiss maps with the official "Höhenschichten-Karte von Bayern," on the scale of 1:250,000 (Bl. 7, 8, 9). This is the first official large-scale map which has been executed by a combination of "Schattenplastik" and "Farbenplastik," using the Vienna scheme of colouring. In this map alone is the relief visibly presented in its actual form. In this way the third dimension, that of depth or height, is presented to the eye with equal precision with the other two dimensions.

GENERAL.

The German Geographentag.—As was announced in our last number, the German Geographentag took place at Nürnberg towards the end of May, and, according to the programme of the meeting sent out beforehand, the subjects discussed under the various subdivisions of geography were unusually varied and instructive. Five regular sittings were arranged, and were devoted respectively to (1) Reports on Journeys of Exploration; (2) The History of Geography and the Regional Geography of Northern Bavaria: (3) Geographical Education; (4) Anthropogeography and Historical Geography; (5) Limnology and Potamology. Among the papers put down for discussion the following may be cited as instances of subjects which engage the attention of Continental geographers, beyond the more obvious themes connected with the results of exploration, and so forth. Prof. Oberhummer, of Vienna, spoke on "The Plans of Cities, their development and geographical significance;"* Dr. Gasser, of Darmstadt, on "The Technique of

* This appears, somewhat singularly, under the head of the History of Geography, not, as might have been expected, under Anthropogeography.

Apianus' Map of Bavaria;" Dr. J. Müller, of Nürnberg, on "The Nürnberg Reichswald, its surface features and economic development from the thirteenth to the sixteenth century." Among the educational papers, one by Dr. Max Eckert on "Scientific Cartography as a University Subject," and another by Dr. E. Blank on "The Importance of Geological Maps in relation to Agriculture, and their employment in Schools," may be mentioned. Finally, among papers of the fourth group, we find dissertations on the "Climatic Conditions at the opening of the Neolithic Period" (by Prof. W. Götz), and on "The Geography of the temporary Settlements of the Alps" (by Prof. R. Sieger).

CORRESPONDENCE.

The Zimbabwe Temple, and the Discovery of Nanking China, etc.

On my return from Great Zimbabwe just recently, my attention was called to a statement made by Prof. J. L. Myres in his review in the *Journal* of Prof. MacIver's Mediæval Rhodesia,' in which he says I might have found the Nanking china "in the cement mass [under the hut] which stands upon that floor."

Probably Prof. Myres' conjecture may rest on a statement made by Prof. MacIver: "Mr. Hall states that he found in enclosure 15, and therefore necessarily within the same cement which I dug (for its foundations can be traced even now, and occupy the entire enclosure), mediæval Arabic glass and Nanking china;" and further on, "The date of the elliptical temple, then, is not earlier than the fourteenth or fifteenth century."

Briefly the facts are these: (1) Almost three years before Prof. MacIver visited Zimbabwe I found small pieces of Nanking china and Arabic glass at the east end of No. 15 enclosure. These were found almost at the top of a layer (about 3 feet deep) of old Kafir *débris* of the usual midden type, at about 1 foot or 18 inches on the east side, and 2 feet above the top of the opening of the drain which passes right through the north divisional wall of this enclosure, the drain being slightly above the foundations of the wall. The point where I made the "find" is at least 8 or 9 feet from the nearest point of the cement (not a cement, but a *daga* of veld soil clay) foundation on which the hut stood, which *daga* foundation has well-defined sides, the hut and the foundation having been, as photographs show, partially ruined, not by any spade-work, but by a large tree growing out of the clay foundation.

Two years before Prof. MacIver's visit, I had published the fullest particulars as to the exact location of the "find," and in my 'Great Zimbabwe,' I showed the spot in a section of the enclosure (p. 103).

This 3-feet depth of Kafir *débris* contained no soil, or cement, or clay work, but consisted entirely of wood ashes, charred wood, decayed ivory, ox, buck, and bird bones split open Kafir fashion for marrow, and a mass of broken pottery. The trench I originally made was but a small one, and was directly up against the face of the wall, and it was only just large enough to reveal the opening of the drain and 2 or 3 feet on either side of it. This trench was left open for almost 18 months, and during that time it was inspected by many visitors, who were all satisfied that the glass and china could not have got into that position until long after the drain had been blocked up and buried for 3 feet at least in Kafir *débris*, which blocking up and burial had for an exceedingly long time rendered the drain altogether useless. I was led to make my trench in that position because I had found the other opening of the drain on the opposite side of the wall.

(2) The clay mass on which the hut stood did not extend to within at least 8 feet of the drain. It most certainly did not "occupy the entire enclosure." An examination of the face of the walls shows, particularly in their courses and joints, and in their ash *débris* stainings and discolorations, that this was not the case. But supposing it had done so—and there are overwhelming evidences still existing that such was not the case—what object could the two drains through the walls have possibly served, for they are still 4 or 5 feet below the level of the present top of the clay structure? The drains were intended to drain the floor of the enclosure, which, according to Prof. MacIver, was originally filled in with clay to a height of some feet above the drains, and this clay-work occupied the entire enclosure! Had it done so, as he suggests, the drains would have been buried to a depth of 3 or 4 feet in clay.

(3) But right under the centre of the clay structure I obtained, and Prof. Doncaster and several other visitors also obtained, in Prof. MacIver's own trench which he cut through the cement structure, without finding either glass or china, ox and buck teeth and pieces of wood, which it would be most preposterous to suggest as being of the age of the main walls of the temple.

Prof. MacIver but substantiates my case, which was stated over three years before his visit, that the clay mass and the hut upon it are of far more recent date than the erection of the main walls of the temple. The hut was obviously built by later occupiers. In my forthcoming 'Ancient and Mediæval Rhodesia,' I show this to be the case.

One other matter as to the discovery of Nanking china at the temple can be explained. It was reported two years ago that Nanking china had been found by Prof. MacIver *under* the foundations of the main walls of the temple. This, from examinations made of the foundations of the main walls of the temple, is, of course, impossible. But a piece of china was found by Prof. MacIver in No. 5 enclosure at 18 inches below the level of the foundations of the south main wall, but at 37 feet north-north-east (practically at right angles from the wall), and in soil which had been deeply double-trenched during 1892-4 by prospectors for relics and gold, whose handiwork at this spot I had described in 'Great Zimbabwe' two years before Prof. MacIver's visit there. These vandals in their illegal quest had broken up the original floors and all structures both of stone and cement, and had hopelessly mixed soils, deposits, and *débris*. It was in this disturbed soil the piece of Nanking china was found, and at a still lower depth I had already stated in 'Great Zimbabwe' that a soda-water bottle, the brown glass and wire-netting of a cognac bottle, a clay pipe, and an umbrella-frame, were also found. Nanking china discovered under these conditions can provide no possible "valid chronological data" to determine the time when the main walls of the temple were erected. R. N. Hall.

Kenilsworth, Cape Town, April 8, 1907.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1906–1907.

Research Department.

April 19, 1907.—Major C. F. Close, C.M.G., R.E., in the Chair.

The paper read was:—

"The Origin and Influence of the Chief Physical Features of Northumberland and Durham." By David Woolacott, D.Sc., F.G.S.

Eleventh Meeting, April 29, 1907.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS.—*Captain H. S. Anderson, R.A.M.C.; Gustave Antoine; John Alfred Austin; Oliver Bainbridge; Professor Henry Boazman; William Clarke; Captain David C. E. Ffrench Comyn; Captain W. F. Savery Edwards, D.S.O.; S. C. Gilmour; Captain Alexander Ronald Kirkpatrick, R.G.A.; R. H. Hayne; William Helme; Captain Philip Temple Maxted (3rd East Yorkshire Regt.); B. B. Mukerjea; Frederick Palmer; John James Warbrick; William Weddell.*

The paper read was:—

"Polar Problems." By H. E. Dr. Fridtjof Nansen, G.C.V.O.

Twelfth Meeting, May 13, 1907. The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS.—*Robert John Barrett; Major Archibald Crawford, R.G.A.; T. Newman Darling; Joseph Landor Eastland; August Ferber; Percy Edward Lovell Gethin; Frank Grove; Major R. N. Harvey, D.S.O., R.E.; Major A. W. Hewetson, R.G.A.; Arthur Howard; John Hughes; G. E. Leachman, Royal Sussex Regt.; J. Philip Liervogel, F.R.C.S.I., L.R.C.P.; Duncan Paul Livingstone; Henry Colbeck Michell; Colonel Richard E. R. Morse, R.A.M.C.; Alfred Norton, D.S.O.; Rev. W. M. Probert; David Ricardo; John Shepherd Sawrey; T. R. Shields; Fullerton Leonard Waldo; Arthur Henry Whitcher.*

The paper read was:—

"An Expedition from the Niger to the Nile." By Lieut. Boyd Alexander.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic. **Cori.**

Ein österreichisches Forschungsschiff. Projekt eines solchen für die Zwecke der ozeanographischen und biologischen Erforschung der Adria. Von Prof. Carl J. Cori. Wien, etc.: W. Braumüller, 1906. Size 10 × 6½, pp. 26. *Map and Illustrations. Price* 9*d*.

Written with a view to stimulating interest in the provision of a vessel, to be specially used for the researches undertaken by the "Verein zur Förderung der naturwissenschaftlichen Erforschung der Adria."

Alps. *M.K.K.G. Ges. Wien* **49** (1906): 465–492. **Hoffer.**

Unterirdisch entwässerte Gebiete in den nördlichen Kalkalpen. Von Dr. Max Hoffer. *With Sketch-maps.*

Alps—Simplon. *M.K.K.G. Ges. Wien* **49** (1906): 493–503. ——

"De Mont Simplono" (Historisches vom Simplonwege). Von D-f.

Austria—Alps—Lakes. *Petermanns M.* **52** (1906): 252–258. **Endrös**

Seichesbeobachtungen an den grösseren Seen des Salzkammergutes. Von Dr. Anton Endrös.

Austria—Bohemia. *M.K.K.G. Ges. Wien*, **49** (1906): 436–439. **Daneš.**

Geomorphologische Studien in den Tertiärbecken Südböhmens. (Ein vorläufiger Bericht.) Von Dr. Jiři V. Daneš.

Austria—Carinthia. *M.K.K.G. Ges. Wien* **49** (1906): 417–435. **Heritsch.**

Glaziale Studien im Vellachtale. Von Dr. Franz Heritsch. *With Sketch-map.*

Austria—Karst. *Abréje B.S. Hongroise G.* **34** (1906): 134–146. **Daneš.**

Ein Beitrag zur Kenntnis des Karstphänomens. Von Dr. Ivić V. Daneš. (Földrajzi Közlemények **34** (1906): 305–313. *With Diagrams.*)

Noticed in the Monthly Record (April, p. 455).

Baltic. *Conseil Perm. Explor. Mer., Rapports, etc.* **5** (1906): pp. 274. ——

Bericht über die Tätigkeit der Kommission C2 [Geschäfts-führer Dr. C. G. Joh. Petersen] in den Periode Februar 1903–März 1906. *With Charts and Illustrations.*

Belgium—Hainaut. **Hocquet.**

Tournai et le Tournaisis au XVI^e^ siècle au point de vue politique et social. Par Adolphe Hocquet. (*Mém. A.R. Belgique* **1** (1906): Fasc. 2, pp. 418.) *With Map.*

France—Haute-Savoie. *B.S.G. Lille* **46** (1906): 285–297. **Douxami.**

Le désert de Platé et les montagnes entre l'Arve et le Giffre (Haute-Savoie). Par H. Douxami. *With Illustrations.*

France—Pyrenees. *B.S.G. Com. Paris* **28** (1906): 653–659. **Descombes.**

Études d'économie pastorale dans les Pyrénées. Par Paul Descombes.

Deals with the French Pyrenean departments.

Germany—Cities. *G. Anzeiger* **7** (1906): 241–242. **Tronnier.**

Die Grossstadtferne Deutschlands in den Jahren 1871 and 1905. Von Rich. Tronnier. *With Maps.*

Germany—Friesland. **Bielefeld.**

Die Geest Ostfrieslands. Geologische und geographische Studien zur ostfriesischen Landeskunde und zur Entwickelungsgeschichte des Emsstromsystems. Von Dr. Rudolf Bielefeld. (*Forschungen zur deuts. Lande- und Volksk.* **16** (1906): 287–460.) *With Maps and Illustrations.*

Germany—Industries. *Petermanns M.* **52** (1906): 192–204. **Dan.**

Geographische Verbreitung der Berufsgruppe des Deutschen Reiches: Chemische Industrie in Jahre 1895. Von Dr. Walter Dan. *With Map.*

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Wald und Niederschlag in Westpreussen und Posen und die Beeinflussung der Regen- und Schneemessung durch den Wind. Bericht der meteorologischen Abteilung des forstlichen Versuchswesens in Preussen. Von J. Schubert.

Holland—Geology. *K.A.W. Amsterdam, P. Sect. Sc.* **8** (1905): 427–436. **Dubois.**

The geographical and geological signification of the Hondsrug, and the examination of the erratics in the Northern Diluvium of Holland. By Prof. Eng. Dubois.

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Geol. Mag., Dec. V., **3** (1906): 406–412.

Tarns on the Haystacks Mountain, Buttermere, Cumberland. By R. H. Rastall and Bernard Smith. *With Map and Illustrations.*

Noticed in the Monthly Record (March, p. 343).

United Kingdom—Scotland. *Ann. de G.* **15** (1906): 237–248. **Hardy**

La végétation des Highlands d'Écosse. Par Marcel Hardy. *With Map.*

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The Plant Remains in the Scottish Peat Mosses. Part II. The Scottish Highlands. By Francis J. Lewis. (From the *Transactions of the Royal Society of Edinburgh*, vol. **45**, part II. (No. 13).) Edinburgh, 1906. Size 12¼ × 9¼, pp. [26]. *Plates. Presented by the Author.*

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Memoirs of the Geological Survey: England and Wales. Explanation of Sheet 193. The Geology of the Country around Stoke-upon-Trent. By Walcot Gibson and C. B. Wedd, with Notes by George Barrow. Second Edition. London, 1905. Size 9½ × 6, pp. viii. and 86. *Map and Diagrams. Price* 1*s.* 6*d. Presented by the Geological Survey.*

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Ecology of Woodland Plants in the Neighbourhood of Huddersfield. By T. W. Woodhead. *With Map and Illustrations.*

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Reiseskizzen aus Centralasien. Von Dr. Julius Prinz. (*Földrajzi Közlemények* **34** (1906): 371–379.) *With Diagrams.*

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Colonial Reports, Miscellaneous, No. 37. Ceylon. Report on the Results of the Mineral Survey in 1904-5. By Prof. W. R. Dunstan. London, 1906. Size 9¼ × 6, pp. 46. *Price* 2½*d.*

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Le territoire français de Kouang-tchéou. Par Paul Barré.

China—Railway. *B. American G.S.* **38** (1906): 554–556. ——

The Peking-Hankow Railway. *With Map.*

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Sicawei Observatory. Notes on the climate of Shanghai, 1873–1902. By J. de Moidrey. Shanghai, 1904. Size 7½ × 5, pp. 40. *Chart and Diagrams. Price* 2*s.* 6*d.*

Supplies useful information, not easily to be obtained elsewhere, on the basis of observations at the Jesuit observatory.

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Chinese Empire—Turkestan. *T'oung Pao* **7** (1906): 469–480. **Stein.**

Hsüan-Tsang's Notice of P'i-mo and Marco Polo's Pein. By Dr. M. Aurel Stein.

Dutch East Indies. **Heger.**

Bericht über eine Studienreise nach Niederländisch-Indien (30 Dezember, 1903–29. September, 1904). Von Franz Heger. (Separat-Abdruck aus dem xxi. Band der

Annalen des k.k. Naturhistorischen Hofmuseums.) Wien, 1906. Size 11 × 7, pp. 40.

The principal attention appears to have been devoted to ethnology, but the paper includes notes on the geography and geology of the places visited.

Dutch East Indies—Java—Rainfall. **Niermeyer.**

Ts. K. Nederlandsch Aardrijksk. Genoots. **23** (1906): 1182–1185.

De regenval aan de vlakke kusten van Java. Door J. F. Niermeyer.

Dutch East Indies—Moluccas. **McClymont.**

The First Expedition of the Portuguese to Banda, and the Events Antecedent thereto. Compiled . . . by James Roxburgh McClymont. Hobart, 1905. Size 10 × 6, pp. 10. *Presented by the Author.*

Eastern Asia—Historical. *T'oung Pao* **7** (1906): 437–468. **Gerbillon and Cordier.**

Cinq lettres inédites du Père Gerbillon, S.J., Missionaire français à Pe-king (XVII^e^ et XVIII^e^ siècles). Publiées par Henri Cordier.

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Publications de la Société des Études Indo-Chinoises. Géographie physique, économique et historique de la Cochinchine: 7^e^–9^e^ fascicules. Monographies des provinces de Bên-tré, Sa-déc, et Tra-vinh. Saigon, 1903. Size 10 × 6½, pp. (fasc. 7) 66; (fasc. 8) 32; and (fasc. 9) 44. *Maps. Price* 3*s. each.*

India. **Reynolds-Ball.**

The Tourist's India. By Eustace Reynolds-Ball. London: Swan, Sonnenschein & Co., 1907. Size 8 × 5, pp. xii. and 364. *Map and Illustrations. Price* 10*s.* 6*d. Two copies, presented by the Author and Publishers.*

India—Burma. *Jahresb. G.-Ethnogr. Ges., Zurich,* 1905–06 (1906): 41–154. **Wehrli.**

Zur Wirtschafts-Geographie von Ober Burma und den nördlichen Shan-Staaten. Von Dr. Hans J. Wehrli. *With Maps and Illustrations.*

India—Minerals. *Records Geol. Surv. India* **34** (1906): 45–78. **La Touche.**

The Mineral Production of India during 1905. By T. D. La Touche.

India—Survey.

Administration Report of the Marine Survey of India, 1905–06. Bombay, 1906. Size 13 × 8½, pp. 14.

Surveys were in progress during the year in Aden harbour and in the Andamans.

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Includes a summary of the recommendations of the Committee on Indian Surveys.

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Abyssinia. *M. k.k. G. Ges., Wien* **49** (1906): 377–416. **Mylius.**

Reise nach Kaffa und Da'uro. Von Alphons Freiherrn von Mylius.

Some account of this expedition was given in the *Journal* for May, 1906 (p. 503).

Abyssinia—Treaty.

Treaty Series, No. 1, 1907. Agreement between the United Kingdom, France, and Italy respecting Abyssinia. Signed at London, December 13, 1906. London, 1907. Size 9½ × 6, pp. 8. *Price* 1*d.*

See note in the February number (p. 225).

Africa—Transport. *Z. Kolonialpolitik, etc.* **8** (1906): 902–924. **Kurchhoff.**

Die Lastenbeförderungsmittel in Africa. Von D. Kürchhoff.

Central Africa—Tanganyika. *T. Zoological S.* **17** (1906): 537–600. **Boulenger.**

Fourth Contribution to the Ichthyology of Lake Tanganyika.—Report on the Collection of Fishes made by Dr. W. A. Cunnington during the Third Tanganyika Expedition, 1904–1905. By G. A. Boulenger. *With Plates and Sketch-map.*

Egypt—Surveys. **Lyons**

A Report on the work of the Survey Department in 1905. By Captain H. G. Lyons. Cairo, 1906. Size 11 × 8, pp. 76. *Maps and Illustrations.*

Eritrea—Climate. *Riv. Col.* **2** (1906): 133–169. **Tancredi.**
Appunti di climatoiogia eritrea. Di A. M. Tancredi.
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French Congo—Railway. *La G., B.S.G. Paris* **14** (1906): 405–410. **Cambier.**
Mission technique au Congo français. Le chemin de fer projeté. Par le capitaine L. Cambier. *With Sketch-map.*
See note in the March number (p. 347).

German East Africa. *Deutsches Kolonialblatt* **17** (1906): 747–751. **Jaeger.**
Bericht des Dr. Fritz Jaeger an den Vorsitzenden der Landeskundlichen Kommission über eine Reise nach dem Kibo. *With Illustrations.*
See note in the Monthly Record (April, p. 457).

Italian Somaliland—Mogdishu. *Riv. Col.* **2** (1906): 202–212. **Rossetti.**
Tre note sulla città di Mogadiscio. Di Carlo Rossetti. *Also separate copy, presented by the Author.*
Historical notes on the town.

Morocco. **Leclercq.**
Le Maroc. Par Jules Leclercq. (Extrait de la *Revue Générale*, mars, 1906.) Bruxelles, 1906. Size 9½ × 6, pp. 18. *Presented by the Author.*

Morocco—Sebu. *La G.* **14** (1906): 181–184. **Pobeguin.**
Reconnaissance du Sebou par la mission Dyé. Par E. Pobeguin. *With Map and Illustrations.*
The general results of the Dyé mission were referred to in the February number, p. 226.

South Africa—Kalahari. *B.S.R. Belge G.* **30** (1906): 174–184. **Zels.**
Le Kalahari au pointe de vue de la géographie humaine. Par L. Zels. *With Maps.*

Transvaal—Irrigation. *Minutes of P., I. Civil Engineers* **165** (1906): 265–281. **Collins.**
Irrigation in the Transvaal. By Michael Richard Collins.

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Tristan da Cunha. Further Correspondence relating to the Island of Tristan da Cunha. London: Wyman & Sons, 1906. Size 13 × 8½, pp. iv. and 64. *Map and Illustration. Price* 10*d.*
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Tunis—Historical. *B. de G. hist. et descriptive* **20** (1905): 311–330. **Demontès.**
La mission du Commandant Huder à Tunis (1831). Par Victor Demontès.

West Africa—Ethnology. *B. de G. Hist. et Descriptive* **20** (1905): 357–412. **Avelot.**
Recherches sur l'histoire des migrations dans le bassin de l'Ogôoué et la région littorale adjacente. Par R. Avelot. *With Maps. Also separate copy, presented by the Author.*

West Africa—Historical. *Z. Kolonialpolitik, etc.* **8** (1906): 767–780. **Götz.**
Die brandenburgish-preussische Kolonisation in Guinea unter Friedrich Wilhelm, dem Grossen Kurfürsten. Von Adolf Götz.

West Africa—Waterway. *Deutsche Kolonialzeitung* **23** (1906): 304–305. **[Faure.]**
Der Wasserweg von Meerbusen von Guinea zum Tschadsee. *With Sketch-map.*
On Captain Faure's expedition.

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Report on Progress of Investigations of Mineral Resources of Alaska in 1905. By Alfred H. Brooks and others. *With Maps and Illustrations.*

Canada—British Columbia. **Wheeler.**
The Selkirk Range, British Columbia. By A. O. Wheeler. Vol. **2**. *Case of Maps.* Size 9½ × 6½. *Presented by the Author.*
Vol. **1** was noticed in the November number (p. 501).

Canada—Labrador. *B. American G.S.* **38** (1906): 529–539. **Hubbard.**
Labrador, from Lake Melville to Ungava Bay. By Mrs. Leonidas Hubbard. *With Map and Illustrations.*
See Monthly Record, March, p. 349.

United States—California. *J. of G.* **5** (1906): 289–301. **Carey.**
The great fault of California and the San Francisco earthquake, April 18, 1906. By Everett P. Carey. *With Illustrations.*

United States—California. **Davidson**
P. Amer. Philos. S. **45** (1906): 164–165, 178–182.
The San Francisco Earthquake of April, 1906. By Prof. G. Davidson.
Points of Interest involved in the San Francisco Earthquake. By the same.

United States—Colorado. *Popular Sc. Monthly* **69** (1906): 417–424. **Crook.**
The making of the Grand Cañon of the Colorado. By Prof. A. R. Crook. *With Illustrations and Section.*

United States—Geology. **Emmons and Eckel.**
B.U.S. Geol. Surv., No. 285 (1906): pp. 506.
Contributions to Economic Geology, 1905. S. F. Emmons and E. C. Eckel, Geologists in charge. *With Maps and Sections.*

United States—Immigration. **[Lindsay.]**
Report on Immigration into the United States. (Diplomatic and Consular Reports, Miscellaneous, No. 655.) London, 1906. Size 9½ × 6, pp. 30. *Price* 2*d.*

United States—Michigan. **Jefferson.**
Material for Geography of Michigan. By Mark S. W. Jefferson. Ypsilanti, 1906. Size 10 × 7, pp. 90. *Maps and Illustrations.*

United States—Montana and Wyoming. **Darton.**
U.S. Geol. Surv., Prof. Paper, No. 51 (1906): pp. 130.
Geology of the Bighorn Mountains. By N. H. Darton. *With Maps, Plates, and Sections.*

United States—Norwegians. *Norske G.S. Aarbog* **17** (1905–6): 17–64. **Kiaer.**
Den norsk-amerikanske Befolknings geografiske Udbredelse i de Forenede Stater. Af A. N. Kiaer. *With Sketch-maps.*

United States—Vermont. *P. Boston S. Natural Hist.* **33** (1906): 9–42. **Fisher.**
Terraces of the West River, Brattleboro, Vermont. By E. F. Fisher. *With Maps, Sections, and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine—Irrigation. **Wauters.**
An. S. Cient. Argentina **57** (1904): 49–97, 113–161, 241–288, 305–310.
El dique de embalse del Cadillal. Por Carlos Wauters. *With Maps, Plans, and Diagrams.*

Bolivia. **Zalles.**
Quinientas Leguas a traves de Bolivia. Relacion del viaje de reconocimiento practicado para establecer un sistema de ferrocarriles en Bolivia, 1904-1905. Por Jorje E. Zalles. La Paz, 1906. Size 9 × 6, pp. 176. *Map and Illustrations.*

Bolivia—Ethnology. **Quevedo and Armentia.**
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Los Indios Mosetenes y su lengua. Introducción, por Samuel A. Lafone Quevedo. Noticias generales y vocabularios, por el P. Fr. Nicolas Armentia.

British Guiana. *B. American G.S.* **38** (1906): 539–553. **Heilprin.**
Impressions of a Naturalist in British Guiana. By Prof. Angelo Heilprin. *With Illustrations.*

Chile—Seismology. *B.S.G. Italiana* **8** (1907): 30–37. **Baratta.**
Sulla distribuzione topografica dei terremoti nel Chili. Del Dott. M. Baratta. *With Map.*
Noticed in the Monthly Record (April, p. 462).

Chile—Valparaiso. *Tour du Monde* **13** (1907): 1–12. **Bourdon.**
La catastrophe de Valparaiso. Par Henri Bourdon. *With Illustrations.*

Costa Rica. *Tour du Monde* **12** (1906): 529–540. **Saillard.**
En traversant la République de Costa-Rica. Par M. Saillard.

West Indies—Cuba. *Nat. G. Mag.* **17** (1906): 535–568. ——
Cuba—the Pearl of the Antilles. *With Map and Illustrations.*

West Indies—Porto Rico. *Monthly Weather Rev.* **34** (1906): 315–324. **Alexander.**

Climatology of Porto Rico from 1867 to 1905, inclusive. By William H. Alexander.

West Indies, etc. *Tour du Monde* **12** (1906): 541–576. **Dufau.**

Voyage au pays du cacao et du sucre de canne. Une mission à la Barbade, à la Guyane anglaise et à la Trinidad. Par Th. Dufau. *With Maps and Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Fishes. **Stead.**

Fishes of Australia: a popular and systematic guide to the study of the wealth within our waters. By David G. Stead. Sydney, 1906. Size 8½ × 5½, pp. xii. and 278. *Illustrations. Price* 5*s. Presented by the Board of Fisheries for New South Wales.*

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France. No. 1 (1906). Convention between the United Kingdom and France confirming the Protocol signed at London on February 27, 1906, respecting the New Hebrides. London, 1906. Size 13 × 8½, pp. 32. *Price* 3½*d.*

See note in the Monthly Record (February, p. 230).

Pacific Islands—Nomenclature. *G. Anzeiger* **7** (1906): 247–249. **Arldt.**

Die Namen der ozeanischen Inselgruppen. Von Dr. Th. Arldt.

South Australia. *P.R.G.S. Australasia, S. Australian Br.* **8** (1904–06): 48–54. **Gill.**

Who discovered Lake Alexandrina? By Thomas Gill.

Shows, from records preserved at Sydney, that Lake Alexandrina had been discovered from the south, possibly by Captain Forbes, of the sealer *Prince of Denmark*, before being reached by Sturt.

South Australia—Historical. **Horrocks.**

P.R.G.S. Australasia, S. Australian Br. **8** (1904–06): 36–47.

John Ainsworth Horrocks' Journal. *With Map and Illustrations.*

Horrocks emigrated to South Australia in 1837, and gave promise of a useful career as an explorer, but died from the effects of a gun accident in 1846, during the expedition described in the journal here printed.

South Australia—Kangaroo Island. **Smyth.**

P.R.G.S. Australasia, S. Australian Br. **8** (1904–06): 55–58.

Frenchman's (Baudin's) Rock, Kangaroo Island. By C. E. Owen Smyth. *With Illustration.*

Western Australia—Pearl Fishery. **Sowden.**

P.R.G.S. Australasia, S. Australian Br. **8** (1904–06): 21–31.

On Pearl-fishing in North-West Australia. By W. J. Sowden.

POLAR REGIONS.

Antarctic—Ice. *Geological Mag., Dec.* V. **3** (1906): 529–534. **Ferrar.**

The Antarctic Ice-cap. By H. T. Ferrar. *With Illustrations.*

A reply to Mr. Schwarz's note (cf. *Journal*, vol. **27**, p. 636).

Antarctic—Marine Flora. **Skottsberg.**

Observations on the vegetation of the Antarctic Sea. By Carl Skottsberg. (Särtryck ur "Botaniska Studier," tillägnade F. R. Kjellman.) Upsala, 1906. Size 10 × 7, pp. [20.] *Map and Illustrations. Presented by the Author.*

Antarctic—South Georgia. **Lönnberg.**

Contributions to the Fauna of South Georgia. I. Taxonomic and Biological Notes on Vertebrates. By Einar Lönnberg. (K. Svenska Vetenskapsakademiens Handlingar, Band 40, No. 5.) Upsala, etc., 1906. Size 12½ × 10, pp. 104. *Illustrations.*

Arctic—Swedish Expedition. **Hamberg.**

Hydrographische Arbeiten der von A. G. Nathorst geleiteten schwedischen Polarexpedition, 1898. Von Axel Hamberg. (K. Svenska Vetenskapsakademiens Handlingar, Band 41, No. 1.) Upsala, etc., 1906. Size 12½ × 10, pp. 56. *Maps and Illustrations.*

Arctic Ocean. **Nansen.**

Northern Waters: Captain Roald Amundsen's Oceanographic Observations in the Arctic Seas in 1901, with a discussion of the Origin of the Bottom Waters of the

Northern Seas. By Fridtjof Nansen. Christiania, 1906. Size 10½ × 7, pp. 146. *Charts and Sections. Presented by the Author.*

Polar Regions. *Monthly Rec.* **25** (1906): 33–53. **Arctowski.**

Polar Problems and the International Organisation for their solution. By Henryk Arctowski.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cartography. **Frith.**

The Topographical Section of the General Staff: with an Account of the Geographical Services of the Austrian, French, German, and Russian, Armies. By Captain G. R. Frith, Chatham, 1906. Size 7 × 5½, pp. 64.

Geodesy. *M.V.E. Dresden* (1906): 12–39. **Pattenhausen.**

Der Anteil der Vereinigten Staaten an der Erforschung der Erdgestalt durch Gradmessungen. Von B. Pattenhausen. *With Map.*

Longitudes. *Petermanns M.* **52** (1906): 261–262. **Hammer.**

Geographische Längen durch die drahtlose Telegraphie. Von Prof. Dr. E. Hammer.

On a recent experiment conducted by Herr Albrecht of the Potsdam Geodetic Institute for the testing of longitude determination by wireless telegraphy.

Surveying. **[Clancey.]**

Survey Manual for Land Records Officers. [By J. C. Clancey.] Rangoon, 1906. Size 10 × 7, pp. vi. and 42. *Plans and Illustrations. Price* 9*d*. *Presented by the Author.*

Surveying—Tables. **Burrard.**

Auxiliary Tables to facilitate the calculations of the Survey of India. Fourth Edition. Revised and extended . . . By Lieut.-Colonel S. G. Burrard. Dehra Dun, 1906. Size 11 × 8½, pp. 104 and 176. *Charts. Presented by the Surveyor-General of India.*

Time. *Publs. U.S. Naval Observatory*, 2 Ser. **4** (1906): Appendix iv., pp. 28. **Hayden.**

The present status of the use of Standard Time. By Lieut. Edward Everett Hayden.

A useful table facilitates the conversion of the standard time of one country into that of any other.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. *Monthly Weather Rev.* **34** (1906): 201–205. **Ball.**

Present day climates in their time relation. By Frank Morris Ball.

The writer shows that the idea of present-day changes of climate are hardly substantiated by facts.

Climatology. *K.A.W. Amsterdam, P. Sect. Sc.* **8** (1905): 155–165. **Easton.**

Oscillations of the solar activity and the climate. (Second communication.) By Dr. C. Easton. *With Diagrams.*

Climatology. *Popular Sc. Monthly* **69** (1906): 458–470. **Ward.**

Changes of Climate. By Robert De C. Ward.

The author shows that beliefs as to contemporary changes of climate must be received with caution.

Geology—Folding. *J. Geology* **14** (1906): 718–721. **Campbell.**

Rock Folds due to Weathering. By Marius R. Campbell. *With Illustration.*

Geomorphology—Mounds. *J. Geology* **14** (1906): 708–717. **Campbell.**

Natural Mounds. By Marius A. Campbell. *With Illustrations.*

Geomorphology—Natural Bridges. **Früh.**

Ueber Naturbrücken und verwandte Formen, mit spezieller Berücksichtigung der Schweiz. Ein Beitrag zur Landeskunde, von J. Früh. St. Gallen, 1906. Size 8 × 5½, pp. 30. *Maps and Illustrations. Presented by the Author.*

Geophysics. *C.R.A. Sc., Paris* **143** (1906): 710–712. **Jourdy.**

Le substratum archéen du globe et le mécanisme des actions géodynamiques. Note de E. Jourdy.

Glaciers. **Reid and Muret.**

Commission Internationale des Glaciers. Les variations périodiques des glaciers. Onzième Rapport, 1905, rédigé par Dr. Harry Fielding Reid et Muret. Berlin, 1906. Size 10 × 7, pp. 22.

Glaciers. **Willcox.**

The viscous *vs.* the granular theory of glacial motion. By Oswin W. Willcox. Long Branch, N.J., 1900. Size 9 × 6, pp. 24. *Presented by the Author.*

Ice. *Iz. Imp. Russian G.S.* **41** (1905): 289-396. ———

Report of the Committee for the study of ground-ice on the work done in 1904. *With Map.* [In Russian.]

Oceanography—North Sea Fisheries. ———

North Sea Fishery Investigations. Report of the British Delegates attending the Meeting of the International Council for the Exploration of the Sea, at Amsterdam in 1906, and Reports relating thereto. London, 1906. Size 13 × 8½, pp. 44. *Price* 4½*d.*

Oceanography—Sea-water. **Ruppin.**

Bestimmung der elektrischen Leitfähigkeit des Meereswassers. Von Dr. E. Ruppin. Umkippthermometer als Tiefenmesser. (By the same.) Kiel, 1906. Size 12½ × 10½, pp. [8]. *Presented by the Deutschen Wissenschaftlichen Kommission für die Internationale Meeresforschung.*

Oceanography—Temperature. **Van der Stok**

Ueber Oberflächentemperaturen des Meerwassers unweit der Niederländischen Küste. Von Dr. J. P. Van de Stok. (Koninklijk Nederlandsch Meteorologisch Instituut, No. 102. Mededeelingen en Verhandelingen, No. 4.) Utrecht, 1906. Size 10 × 6½, pp. 25-56. *With Diagram.*

Seismology. *J. College Sc., Tōkyō* **21** (1906): *Article* 1, pp. 20. **Kusakabe.**

Frequency of After-shocks and Space-distribution of Seismic Waves. By S. Kusakabe. *With Map.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *C.R.A. Sc. Paris* **143** (1906): 1186-1188. **Pittard.**

Influence du milieu géographique sur le développement de la taille humaine. Note de Eugène Pittard.

Commercial. **Halle.**

Die Weltwirtschaft: ein Jahr- und Lesebuch, unter Mitwirkung zahlreicher Fachleute herausgegeben von Dr. Ernst von Halle. I. Jahrgang, 1906; III. Teil. Das Ausland. Leipzig, etc.: B. G. Teubner, 1906. Size 11 × 7½, pp. 282. *Price* 5 *marks. Presented by the Publisher.*

Commercial—Ivory. *J.S. Arts* **54** (1906): 1127-1142, 1146-1169, 1174-1183. **Maskell.**

Ivory, in Commerce and in the Arts. By Alfred Maskell. *With Illustrations.*

Historical—Maps. *B.S.G. Italiana* **7** (1906): 1087-1098. **Bruzzo.**

Sopra alcune carte nautiche esistenti nella Biblioteca comunale di Bologna. Del Prof. Giuseppe Bruzzo.

The maps described range from Freducci's atlas of the early part of the sixteenth century to less-known maps of the seventeenth century.

Historical—Map. **Detlefsen.**

Ursprung, Einrichtung und Bedeutung der Erdkarte Agrippas. Von D. Detlefsen. (Quellen und Forschungen zur alten Geschichte und Geographie, Herausgegeben von W. Sieglin. Heft 13.) Berlin: Weidmannsche Buchhandlung, 1906. Size 10 × 6, pp. vi. and 118.

Historical—Map. *Abrégé B.S. Hongroise G.* **34** (1906): 121-129. **Teleki.**

Je ein Monument der Kartographie des xv. und des xvi. Jahrhunderts im Ungarischen Nationalmuseum zu Budapest. Bericht des Gr. Paul Teleki. (Földrajzi Kozlemenyek 34 (1906): 280-287.) *With Facsimiles.*

The documents, which do not seem to have been previously described, are an Atlas of Beniucasa of 1474, and a sixteenth-century Portolano embracing the Mediterranean,

etc. The nomenclature of the west coast of Africa in the former is very much fuller than on Benincasa's map of 1466-67, as is shown by a comparative table.

Historical—Toscanelli. *Riv. G. Italiana* 7 (1906): 419–421. **Uzielli.**

I Toscanelli di Dieppe. Nota di Gustavo Uzielli.

BIOGRAPHY.

Ahlenius. *Ymer* (1906): 305–312. **Andersson.**

Karl Ahlenius. Af J. G. Andersson. *With Portrait.*

The late Professor of Geography at Upsala University, one of the best-known exponents of scientific geography in Sweden, was born in 1866.

Krause. **Köhler.**

Der Philosoph Carl Christian Friedrich Krause als Geograph. Von Dr. Arthur Köhler. Leipzig: Dieterich, 1905. Size 9 × 6, pp. 94.

Linnæus. *Ymer* (1906): 221–250. **Fehr.**

Linnés Svenska resor. Af Isak Fehr.

On Linnæus' journeys in Sweden.

Russell. *J. Geology* **14** (1906): 663–667. **Gilbert.**

Israel Cook Russell, 1852–1906. By G. K. Gilbert. *With Portrait.*

GENERAL.

British Empire. **Smith.**

The British Empire in its true proportions. (Designed and published by Stephen Smith.) Edinburgh, [*n. d.*]. Size 10 × 7¼, pp. 4. *Map. Presented by the Author.*

The map combines representations of different parts of the Empire, projected on different planes in such a way as to show them on a common scale in more or less correct relation to each other.

Descriptive. **Leclercq.**

Jules Leclercq. Spectacles d'outre-mer. Paris: A. Lemerre, 1906. Size 7½ × 5, pp. iv. and 226. *Price* 3.50 *fr. Presented by the Author.*

Sonnets inspired by places and scenery with which the author's travels have made him acquainted.

Diseases. ——

Report of the Advisory Committee for the Tropical Diseases Research Fund for the year 1906. London, 1907. Size 13 × 8½, pp. 56. *Price* 5½*d.*

French Colonies. ——

Ministère des Colonies: Office Colonial. Statistiques Coloniales pour les années de 1900 à 1904. Industrie Minière.—[The same], pour l'année 1905. Publiées sous l'administration de Georges Leygues. Melun, 1906. Size 9½ × 6, pp. (1900–04), 238, (1905) 110.

Geography. *Scottish G. Mag.* **23** (1907): 1–13. **Goldie.**

Geographical Ideals. By Sir George Taubman Goldie. *With Portrait.*

Geography. *Ts. K. Nederlandsch Aardrijksk. Genoots.* **23** (1906): 1097–1181. **Kan.**

Nieuwere opvattingen van Aardrijkskunde. Door Prof. Dr. C. M. Kan. *Also separate copy, presented by the Author.*

German Colonies. *G.Z.* **12** (1906): 545–567, 630–641. **Hänsch.**

Das deutsche Kolonialreich. Eine politisch-geographische Studie von Bruno Felix Hänsch.

Military Geography. **Maguire.**

The Campaigns of Napoleon. By J. Miller Maguire. (Reprinted from the *United Service Magazine.*) London: Clowes & Sons, 1906. Size 8½ × 5½, pp. 8. *Map. Price* 1*s.*

Mountain Sickness. **Longstaff.**

Mountain Sickness and its probable causes. By Dr. T. G. Longstaff. London: Spottiswoode & Co., 1906. Size 8½ × 5½, pp. 56. *Price* 1*s. Presented by the Author.*

See May number, p. 577.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Albania. **Nopcsa.**

Dr. Báro Nopcsa Ferencz. Utazások Éjszak Albaniában [Reisen in Nord-Albanien], 1905–06. Scale 1:100,000 or 1 inch to 1·6 stat. mile. [1907.] *Presented by Baron Nopcsa.*

A somewhat roughly executed sketch-map of routes in the part of Albania to the north-east and south-east of Scutari, which place is shown on the western limit of the map. A black and white sketch-map is given as an inset, showing the main geological features of the district.

Channel Islands. **Bartholomew.**

Bartholomew's reduced survey maps of the Channel Islands. Edinburgh: John Bartholomew & Co., [1907]. *Price 2s. net, mounted on cloth. Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from April 1 to 30, 1907.

2 miles to 1 inch.

Large series, printed in colours, folded in cover or flat in sheets, 1, 2. *Price, on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.*

1 inch—(third edition):—

In outline, sheets 122, 186, 190, 264, 353. 1*s. each* (engraved).

6-inch—County Maps (first revision):—

Carmarthenshire, 15 N.E. **Cornwall,** 4 S.W., 11 N.E., 17 S.W. **Devonshire,** 38 S.E., 49 N.E., 61 S.E., 62 N.E., S.W., 73 S.W., 86 N.E., S.E., 111 S.E., 128 N.W., S.W., 138 N.E. **Lincolnshire,** 34 N.E., 35 S.E., 36 N.W., N.E., S.W., 37 N.E., S.W., S.E., 38 S.E., 47 S.W., S.E., 48 N.W., 49 S.W., 54 N.E., 55 N.W., 65 S.E. **Norfolk,** 19 N.W., N.E., 20 N.E., 22 N.E., 26 N.E., 28 N.E., 29 N.E., 30 S.W., S.E., 38 N.E., 39 N.W., N.E., S.W., 40 S.W., 51 N.W., 66 N.E. **Yorkshire (First Revision of 1891 Survey),** 276 N.E., 277 N.E., S.E. 1*s. each.*

25-inch—County Maps (first revision):—

Cornwall, XVIII. 15; XIX. 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 15, 16; XX. 1, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 16; XXIV. 1, 2, 3, 4, 5, 6, 7, 8 (XXIV. 9 and XXIV*a*. 12), XXIV. 10, 11, 12, 13, 14, 15, 16 (XXIV*a*. 12 and XXIV. 9); XXV. 1, 2, 6, 11, 13, 15; XXVI. 3, 4, 5, 6, 12; XXVII. 13; XXXI. 16; XXXII. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12; XXXIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11; XXXIV. 2, 3, 4, 7, 8, 9, 10, 11, 12; XXXIX. 2, 7, 8, 10, 11; LII. 2, 3, 4, 6, 7, 8, 10, 11, 12; LIII. 1, 2, 3, 4, 5, (6 and 10). **Glamorgan,** I. 11; VII. 2; XXI*a*. 8; XXII*a*. 5, 6, 10, 12, 15. **Kent** (Second Revision), XXIV. 16; XXV. 8; XLVII. 7, 8, 10, 14; XLVIII. 13; LXVI. 10. 3*s. each.* **Lancashire (First Revision of 1891 Survey),** CXI. 1, 11, 15; CXIV. 10, 12, 14, 15; CXV. 5; CXVIII. 1. 3*s. each.* CXI. 16. 1*s.* 6*d.* **Lincolnshire** (First Revision), XXIV. 8; XXX. 5, 6, 7, 8; XXXI. 1, 2, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15; LXX. 9, 14. **Pembrokeshire,** VI. 9, 10, 11, 13, 14; XI. 1, 2, 3, 15. **Yorkshire** (First Revision of 1891 Survey), CCXLVII. 3, 4, 11; CCXLVIII. 2; CCLXVI. 11.

England and Wales. **Geological Survey.**

6-inch—Uncoloured. Brecknockshire, 49 N.E., 50 N.E. Glamorgan, 10 N.W., N.E., S.W., S.E., 11 N.E., S.W., 18 N.W., N.E., S.W. 1*s.* 6*d. each.*

(*E. Stanford, London Agent.*)

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1: 100,000 or 1 inch to 1·6 stat. mile. Sheets: xi. 24, Aulnay; xii. 14, Argentan; xii. 23, La Mothe St. Héray; xii. 37, Luz; xvii. 5, Bergues; xix. 8, Le Cateau; xxi. 18, Montbard(est); xxii. 19, Dijon; xxiv. 36, Toulon. Paris: Ministère de l'Intérieur. Service Vicinal, 1906–07. *Price 0.80 fr. each sheet.*

These are new editions.

Germany. **K. Preuss. Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abteilung der Kg. Preuss. Landesaufnahme. Scale 1: 100,000 or 1 inch to 1·6 stat. mile. Sheet 240,

Wittenberge. Berlin: K. Preussische Landesaufnahme, 1906. *Price* 1.50*M. each sheet.*

London. **Hollar.**

London, Westminster, and Southwark, drawn and engraved by Wenceslaus Hollar. Published at Antwerp in 1647. Sheets iv., v., and vi. London: The London Topographical Society, 1906.

There are altogether six sheets of this famous bird's-eye view of London, of which facsimiles of three only are now published, the remaining three being promised next year. Each sheet measures 18¾ × 15¾ inches, and the three at present issued extend from some distance east of the Tower to the Guildhall and Bow Church. When placed side by side, the sheets present a striking panoramic view of London as it appeared a few years before the Great Fire.

London. **University Extension Guild.**

Map of London showing Local Centres for University Extension Teaching from 1876 to 1905. Prepared from Official Data of the University of London. Scale 1:63,360 or 1 inch to a stat. mile. London: University Extension Guild, 1907.

Spain. **Gillman.**

The Valley of Almanzora, with portions of the Provinces of Jaen, Granada, Almeira, and Murcia. By Gustave Gillman. Scale 1:50,000 or 1·3 inch to a stat. mile. 1907. *Presented by the Author.*

This is a photo-lithographic reproduction, on linen, of a map drawn primarily for the purpose of studying the road communications throughout the district served by the Great Southern of Spain railway, which embraces portions of the provinces of Jaen, Granada, Almeira, and Murcia. The basis of the survey was the centre line of the railway; the geographical positions of Lorca, Aguilas, Baza, and Seron having been fixed by repeated astronomical observations, and these were connected by triangulation with the government triangulation station on the Tetica de Bacares (which was one end of the base used for connecting the Spanish triangulation with the French Survey in Algiers). The result of the triangulation, though only carried out with a 6-inch theodolite, showed it to be so far accurate that the calculated distance between the Tetica de Bacares and Aguilas came within 32 metres of the distance as obtained by the longitude.

The plotting was done by rectangular co-ordinates off the middle latitude, so that there is a slight inaccuracy in the scale at the extreme edges of the map.

The detail has been filled in from various isolated surveys by the author for mining purposes and from advance details of the government surveys of the municipal districts. The course of the Rambla de Nogalte as laid down on this map calls for special attention, as it has been erroneously shown on most maps in the past.

The author proposes to supplement the present map by a contoured one, which is in course of preparation.

Spain. **Méndez.**

Carte des routes d'Espagne. Dediée au Royal Automobile Club d'Espagne avec indications et signes routières de M. le Dr. Wood McMurtry. Dressée par M. José Méndez. Scale 1:1,500,000, or 1 inch to 23·6 stat. miles. Madrid: José Méndez.

Spain. **Méndez.**

Collection d'itineraires des routes, pour la visite des provinces et côtes maritimes d'Espagne, composé de 13 cahiers, dédiés au Royal Automobile Club d'Espagne. Scale 1:200,000 or 1 inch to 3·1 stat. miles. Madrid: José Méndez, 1907.

ASIA.

Caucasia. **Topographical Section, General Staff.**

Map of Caucasia. Scale 1:2,027,520, or 1 inch to 32 stat. miles. Plate 1. London: Topographical Section, General Staff, War Office, 1906. *Presented by the Director of Military Operations.*

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 1 inch to 4 miles. Sheets: 15, parts of districts Rawal Pindi, Jhelum, Shahpur, Attock, and Mianwali (Punjab), and Kohat, Bannu, and Dera Ismail Khan (N.W.F. Province), 1904. 103, parts of districts Azamgarh, Ghazipur, Ballia, Gorakhpur, Benares and Mirzapur (U.P.), and Saran, Muzaffarpur, Darbhanga, Gaya, Patna and Shahabad (Bengal), 1904. 106, parts of districts Sambalpur and Angul (Bengal), Bilaspur (C.P.) and of states Sonpur, Rairakhol, Bamra, Baud and Athmalik (Bengal), Raigarh and Sarangarh (C.P.), 1905. 113,

parts of districts Birdhum, Burdwan, Bhagalpur, Monghyr, Gaza, Manbhum, Murshidabad, Bankura, Sonthal Parganas, Hazaribagh and Ranchi (Bengal), 1903.—District map of India, 1 inch to 64 miles, 1905, 2 sheets.—North-Western Trans-Frontier, 1 inch to 2 miles. Sheets: 441, parts of Afghanistan, Kurram valley and Tirah, 1906.—North-Western Trans-Frontier, 1 inch to 4 miles. Sheets: 21 N.E., parts of Afghanistan and Baluchistan, 1906. 27 S.E., parts of Afghanistan and district Peshawar, 1906. 28 N.W., part of Afghanistan, 1906.—South-Western Asia, 1 inch to 4 miles. Sheet 88 N.E., part of Persia (Fars and Karman), 1906.—Bengal (district maps), Birdhum district, 1 inch to 8 miles, 1904; Darbhanga district, 1 inch to 8 miles, 1906; Gaya district, 1 inch to 8 miles, 1906; Manbhum district, 1 inch to 8 miles, 1905; Palamau district, 1 inch to 12 miles, 1904; Patna district, 1 inch to 8 miles, 1905; Singbhum district, 1 inch to 12 miles, 1905.—Berar, 1 inch to 8 miles, 1906.—Bengal Survey, 1 inch to a mile. Sheets: 62, parts of districts Palamau and Hazaribagh, 1906. 144, parts of districts Muzaffarpur and Darbhanga, 1906. 236, parts of districts Sonthal Parganas, Birbhum, and Burdwan, 1906. 305, parts of districts Murshidabad and Nadia, 1906.—Bombay Survey, 1 inch to a mile. Sheets: 1 and 5, districts Karachi and Cutch State, 1906. 92, parts of districts Ahmedabad and Kathiawar Agency, 1898. 107, parts of district Ahmedabad, Baroda State, and Kathiawar Agency, 1891. 162, parts of district Thana and Jawhar State, 1902. 163, district Thana, 1898. 239, parts of district Satara and Kolhapur and Southern Maratha Agency, 1903.—Sind Survey, 1 inch to a mile. Sheet 73, parts of districts Hyderabad and Karachi, 1906.—Levels in Sind, 1 inch to 2 miles. Sheet 24, districts Larkhana, Upper Sind Frontier, and part of Kalat (Baluchistan), 1906.—Burma Survey, 1 inch to a mile (New Series). Sheets: 193, parts of districts Shwebo and Mandalay, 1906. 264, parts of districts Rangoon Town and Hanthawaddy, 1903. Burma Survey, 1 inch to 4 miles. Degree sheets: 29, parts of districts Magwe, Minbu, Myingyan, Yamethin, and Meiktila, 1906. 31, parts of districts Prome, Tharrawaddi, Henzada, Toungoo, Thayetmyo, and Pegu, 1906. 67, parts of Northern and Southern Shan States, 1906. Index to standard sheets of Burma Survey, 1906.—Central India and Rajputana Survey, 1 inch to a mile. Sheets: 143, parts of states Jodhpur and Udaipur (Rajputana Agency), 1905. 279, parts of district Nimar (C.P.) and states Indore and Dhar (C.I. Agency), 1905. 291, parts of states Jaipur and Tonk (Rajputana Agency), 1905. 294, parts of States Jaipur, Kotah and Bundi (Rajputana Agency), 1905. 295, parts of States Kotah and Bundi (Rajputana Agency), 1905. 297, part of State Kotah (Rajputana Agency), 1905.—Central Provinces Survey, 1 inch to a mile. Sheets: 1, parts of district Nimar (C.P.) and States Indore and Dhar (C.I. Agency, 1905. 44, parts of districts Saugor (C.P.) and Jhansi (U.P.), 1906. 86, parts of districts Jubbulpore, Damoh, and Narsinghpur, 1906. Chanda district, 1 inch to a mile. Sheet 9, 1903.—Eastern Bengal and Assam. District maps: Dinajpur district, 1 inch to 4 miles, 1906; Jalpaiguri district, 1 inch to 4 miles, 1906; Jalpaiguri district, 1 inch to 8 miles, 1905; Mymensingh district, 1 inch to 8 miles, 1905; Naga Hills district, 1 inch to 4 miles, 1905; Pabna district, 1 inch to 8 miles, 1905.—Eastern Bengal and Assam Survey, 1 inch to a mile. Sheets: 25, part of district Kamrup, 1906. 68, part of district Cachar, 1906. 69, parts of districts Sylhet and Cachar, 1906.—Madras Survey, 1 inch to a mile. Sheets: 68, part of district Chitaldroog (Mysore), 1906. 76, parts of districts Mysore, Hassan, and Tumkur (Mysore), Madras, 1903. 77, part of district Mysore (Mysore), 1903. 169, part of district Kolar (Mysore), Madras, 1898.—Punjab, 1 inch to 80 miles, 1905. Simla district, 1 inch to 16 miles, 1906. Punjab Survey, 1 inch to a mile. Sheets: 67, parts of districts Multan and Muzaffargarh (Sindh, Sagar, and Bari Doabs), 1906. 87, part of district Mianwali, 1901. 208, part of district Lahore (Rechna and Bari Doabs), 1906.—United Provinces of Agra and Oudh. District maps: Aligarh district, 1 inch to 8 miles, 1905; Azamgarh district, 1 inch to 8 miles, 1905; Cawnpore district, 1 inch to 8 miles, 1905; Fyzabad district, 1 inch to 4 miles, 1905.—United Provinces Survey, 1 inch to a mile. Sheets: 52, parts of district Aligarh, Etah, and Budaun, 1903. 53, parts of districts Aligarh, Etah, and Mainpuri, 1906. 55, parts of districts Agra and Mainpuri, 1906. 99, parts of districts Pilibhit, Shahjahanpur, and Kheri, 1906. 101, parts of districts Hardoi, Shahjahanpur, Kheri, and Sitapur, 1906. *Presented by the Secretary of State for India.*

Persia. **Herzfeld.**

Routenkarte von Bachdād nach Šīrāz durch Lūristān, Khūristān und Fārs. Nach eigenen Aufnahmen von Ernst Herzfeld. Blatt ii. Scale 1:250,000 or 1 inch to 3·9 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1907, Tafel 17. Gotha: Justus Perthes, 1907. *Presented by the Publisher.*

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. Sheet 119, Walfisch Bay. London: Topographical Section, General Staff, War Office, 1906. *Price 2s. each sheet.*

Egypt. **Survey Department, Cairo.**

Topographical map of Giza Province. Scale 1:10,000 or 6·3 inches to a stat. mile. Sheets: N.E., 1-5, 2-5. Cairo: Survey Department, 1904-5. *Presented by the Director-General, Survey Department, Cairo.*

Egypt. **Survey Department, Cairo.**

Provisional map of South-Eastern Desert of Egypt. Scale 1:500,000 or 1 inch to 7·9 stat. miles. Sheets I. and II. Cairo: Survey Department, 1907. *Presented by the Director-General, Survey Department, Cairo.*

These two sheets are reduced from the 1:100,000 sheets which have been noticed from time to time in the *Geographical Journal*, and include the region between the Red sea and the Nile, extending from 20° to 22° N. lat. They are merely provisional issues, and are printed in blue and brown.

French West Africa. **Service Géographique de l'Afrique Occidentale Française.**

Carte de l'Afrique Occidentale Française. Scale 1:1,500,000 or 1 inch to 23·6 stat. miles. Sheet 1, Sénégal, Mauritanie, partie occidentale du Haut-Sénégal et Niger. Paris: Service Géographique du Gouvernement de l'Afrique Occidentale Française, 1906. *Price 2.50 fr. each sheet.*

The first issue of a new four-sheet map of French Senegal and the adjacent regions. This sheet includes the Gambia, the Senegal, and extends north as far as the 22nd parallel of north latitude.

Gold Coast. **Guggisberg.**

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1:125,000 or 1 inch to 1·9 stat. mile. Sheets: 72 K III., Oboase; 72 W I., Sekondi. Edinburgh and London: W. & A. K. Johnston, 1907. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

These are two sheets of a new map of the Gold Coast from surveys made under the superintendence of Major F. G. Guggisberg, R.E., who a few years ago superseded Major Watherston, R.E., as director of surveys in the colony. Aided by a staff of trained assistants, excellent geographical surveys have been lately carried out for the first time on a well-arranged and systematic basis. Without waiting for an elaborate and lengthy triangulation, which would be impossible in this thick forest region without enormous expense, a series of long latitude and azimuth traverses have been run across the country in suitable directions, and with these, supplemented by theodolite angles and route surveys, it has become possible to undertake the construction of a most useful geographical map on a large scale. In fact, this is another excellent example of what can be done under the direction of an experienced surveyor in the way of producing really useful geographical surveys with rapidity and at small expense compared with that of regular triangulation. It is gratifying to know that this sort of work is now progressing in other parts of the British Empire. By the aid of such maps new and unsurveyed regions are now being mapped with sufficient accuracy for all ordinary purposes.

Major Guggisberg is to be congratulated upon the style in which these sheets have been produced. They are clearly printed in colours—water blue, hills chalked in brown, boundaries red, and lettering black. Special care has been taken with the surveying of the mining concessions, the limits of which are clearly indicated. On the left-hand side of each sheet is a most complete, though perhaps somewhat unnecessarily extended, explanatory table of the symbols employed, abbreviations, types of lettering, and notes on the orthography. The sheets have been very creditably engraved and printed by Messrs. W. & A. K. Johnston.

Gold Coast. **Topographical Section, General Staff.**

(Provisional) map of the Gold Coast. Compiled in the Topographical Section, General Staff. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. London: Topographical Section, General Staff, War Office, 1907. *Price 2s. Presented by the Director of Military Operations.*

Togo. **Sprigade.**

Karte von Togo. Bearbeitet von Paul Sprigade. Scale 1:200,000 or 1 inch to 3·1 stat. miles. Sheets: A 2, Tamberma; C 1, Bismarckburg. Berlin: Dietrich Reimer (Ernst Vohsen), 1906. *Presented by Herr Paul Sprigade.*

The first of these sheets extends from 8° to 9° N. lat. and from 0° 45′ E. to 0° 30′ W. long., and the second from 10° to 11° 10′ N. lat. and from 0° 45′ E. to 1° 25′ E. long. All available surveys and route sketches have been utilized, and the sheets are printed in colours.

AMERICA.

Canada. **Department of the Interior, Ottawa.**

Map of Manitoba, Saskatchewan, and Alberta. Scale 1:792,000 or 1 inch to 12·5 stat. miles. Special edition showing even-numbered sections finally disposed of. Fourth edition, corrected to January 1, 1907. Prepared under the direction of R. E. Young, D.L.S., Superintendent of Railway and Swamp Lands. 3 sheets. Ottawa: Department of the Interior, 1907. *Presented by the High Commissioner for Canada.*

Chile. **Oficina de Limites, Santiago.**

Commission Chilena de Limites. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheets: Atacama-Coquimbo, Magallanes, Tierra del Fuego. Santiago: Oficina de Limites, 1906. *Presented by the Director, Oficina de Limites.*

With the exception of the "Atacama-Coquimbo" sheet, the region included in these sheets in the extreme south of Chile in the neighbourhood of Magallan Strait and Tierra del Fuego. As is the case with all the others of this series, which have been noticed from time to time in this *Journal*, each topographical sheet is accompanied by one showing the traverse lines and triangulation of the same area.

United States—Connecticut. **Gregory and Robinson.**

Preliminary geological map of Connecticut. By H. E. Gregory and H. H. Robinson. Scale 1:250,000 or 1 inch to 3·9 stat. miles. New Haven: Connecticut Geological and Natural History Survey, 1906.

ATLANTIC OCEAN.

Azores. **Direcção Geral dos Trabalhos Geodesicos, Madrid.**

Carta chorographica da Ilha Terceira. Levantada pela Direcção Geral dos Trabalhos Geodesicos em 1899. Scale 1:50,000 or 1·3 inch to a stat. mile. Madrid: Direcção Geral dos Trabalhos Geodesicos, 1906.

GENERAL.

World. **Harmsworth.**

Harmsworth Atlas and Gazetteer. 500 maps and diagrams and 105,000 references. Parts 13 and 14. London: The Amalgamated Press, Ltd., 1907. *Price 7d. each part.*

The maps contained in these parts are:—Part 13: Nos. 9–10, Polar Regions; 47–48, Western France; 67–68, Austria-Hungary (industries and communications). Part 14: Nos. 5–6, The Old World; 35–36, Northern Scotland and the Hebrides; 147–148, Cape Colony.

World. **Stieler.**

Neunten, von Grund aus neubearbeiteten und neugestochenen Auflage von Stielers Hand-Atlas, 100 Karten auf 200 Seiten mit 162 Nebenkarten in Kupferstich und einem alphabetischen Verzeichnis aller im Atlas verkommenden Namen (ungefähr 240,000 Namen enthaltend) herausgegeben von Justus Perthes' Geographischer Anstalt in Gotha. Lieferungen 47, 48, 49, 50, 51, 52. Gotha: Justus Perthes, 1907. *Price 60 pf. each part.*

These double parts contain the following maps:—Part 47–48, Nos.: 1, Der nordliche Sternhimmel; 67, Ostindinische Inseln (Spezialkarten); 79, Australien, Bl. 3; 98, Süd-Amerika, Bl. 4. Part 49–50, Nos.: 66, Hinter-Indien u. Archipel; 73, Africa, Bl. 5; 90, Vereinigte Staaten, Bl. 5. Part 51–52, Nos.: 2, Der südliche Sternhimmel; 74, Africa, Bl. 6; 85, Vereinigte Staaten und Mexico (Uebersicht); 99, Süd-Amerika, Bl. 5

Charts.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March, 1907. *Presented by the Hydrographer, Admiralty.*

New Charts.

No.	Inches.	
121 m =	1·4	Sweden, west coast:—Torbiornskier to Väderöbod. 5*s.*
3633 m =	4·8	Alaska:—Dixon harbour. 2*s.*
3620 m =	12·1	China, south coast:—Canton harbour. 3*s.*
3617 m =	0·69	Japan:—Yume zaki to Modoro zaki. 2*s.*
3623 m =	0·12	Australia, east coast:—Cape Byron to Lady Elliot island. 3*s.*

New Plans and Plans added.

No.	Inches.	
108 m =	11·8	England, east coast. Skegness to Blakeney. New plan:—King's Lynn docks. 4*s.*
1858 m =	3·2	Central America. Plans in Yucatan. Plan added:—Port Morelos. 2*s.*
1304 m =	0·5	Plans on the coast of Chile. New plan:—Comau or Leptepu inlet. 2*s.*
2395 m =	3·6	Ports in the Philippine islands. Plan added:—Paskao anchorage. 2*s.*
1579 m =	9·69	New Hebrides. Malekula island, southern portion. Plan added:—Pangkumu bay. 3*s.*

Charts Cancelled.

No.	Cancelled by	No.
121 Sweden, west coast:—Koster islands and approaches to Stromstad	New chart. Torbiörnskier to Väderöbod	121

Charts that have received Important Corrections.

No. 1547, Ireland, west coast:—River Shannon, Sheet II. 1548, Ireland, west coast:—River Shannon, Sheet III. 1541, Ireland, west coast:—River Shannon, Sheet IV. 1549, Ireland, west coast:—River Shannon, Sheet V. 2552, Ireland, south coast:—Dunmanus bay. 1875, Germany:—Elbe, Weser, and Jade rivers. 2302, Baltic sea:—Gulf of Bothnia, Sheet VII. 3300, Baltic sea. Gulf of Riga:—Windau. 798, France, west coast:—Douarnenez bay and approach. 419, Adriatic:—Anchorages and channels in the gulf of Cattaro. 2843*a*, United States, east coast:—Chesapeake bay, Sheet I. 2818, United States, east coast:—Hampton roads and Elizabeth river. 2866, United States, east coast:—Winyah bay and Georgetown harbour. 1217, Gulf of Mexico:—Florida strait, south part. 486, Gulf of Mexico:—Jamaica and the Pedro bank, etc. 1266, Islands and banks between San Salvador and San Domingo. 456, Jamaica:—Port Royal and Kingston harbours. 2600, Leeward islands:—San Domingo to Dominica. 525, Gulf of Mexico:—Boca Grande cay to Tortugas cays. 1329, South America, east coast:—Bahia Blanca to Union bay. 587, Central America:—Burica point to Mangrove bluff. 629, Africa, west coast:—Walfisch bay. 2089, Africa, east coast:—Tugela river to Delagoa bay. 1235, Persian gulf:—Mouth of the Euphrates. 1884, Bay of Bengal:—Arakan river, Akyab. 794, Malacca strait:—Pulo Berhala to Cape Rachado. 2109, Borneo, sheet VI.:—Barram point to Nosong point. 900, Celebes:—Tilamuta harbour to Tanjong Tuladenggi. 1740, China:—Canton river, Sheet III. 1262, China, south coast:—Hong Kong to gulf of Liau tung. 1760, China, east coast:—The Brothers to Ocksen islands. 1761, China, east coast:—Ocksen islands to Tung Yung, etc. 2347, Japan:—Nipon, Kiusiu, and Shikoku, and part of the Korea. 1030, Australia, east coast:—Great Sandy strait, southern portion. 1031, Australia, east coast:—Great Sandy strait, northern portion. 179, New Hebrides:—Espiritu Santo island.

(*J. D. Potter, Agent.*)

Indian Ocean and Red Sea. **Meteorological Office.**

Monthly meteorological charts of the Indian ocean north of 15° S. lat. and Red sea, May, 1907. London: Meteorological Office, 1907. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, May, 1907. London: Meteorological Office, 1907. *Price 6d. each. Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific ocean, April and May, 1907. Washington: U.S. Hydrographic Office, 1907. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Alaska and British Columbia. **Maclaren.**

Eighty-three photographs of Alaska and British Columbia, taken by Dr. Norman Maclaren. *Presented by Dr. Norman Maclaren.*

An interesting set of 5 × 4-inch photographs taken during last summer by Dr. Maclaren in the country inland from Fort Wrangel, on the Alaskan coast, to the neighbourhood of Dease lake, in the northern part of British Columbia by way of the Stikine river. The subjects are well chosen to illustrate the geographical features, and there are some fine views of the valley of the Stikine. The totem poles and Indian graves are also worthy of special attention.

(1) Grenville sound, looking north; (2) Grenville sound, looking south; (3–8) Totem poles, Fort Wrangel; (9) Mouth of Stickine river; (10) Old Anglo-Alaskan Frontier buildings on Stickine river; (11 and 12) Glacier on Stickine river; (12a) Glacier on Stickine river in autumn; (13) Looking across Stickine river to Glenora; (14) Telegraph Creek, head of steamer navigation on Stickine river; (15) Telegraph Creek, the creek itself cutting through basalt; (16 and 17) Stickine river above Telegraph creek; (18) Thaltan river at its union with the Stickine; (19 and 20) Tuya river close to its union with the Stickine; (21–24) Tributary of Tuya river cutting through coal-beds; (25) Spruce timber near Tuya river; (26) Jack pines near Tuya river; (27) South end of Dease lake; (28) North end of Dease lake; (29) Hudson Bay Company's scow on Dease lake; (30) Trail near Dease lake; (31) Spruce timber near north end of Dease lake; (32–33) Jack pines, Dease lake; (34) Porcupine skins; (35) Country about 35 miles east of south end of Dease lake; (36–38) Carribou killed near Dease lake; (39) Indian scow on Dease lake above McDames creek; (40) McDames creek, Hudson Bay post; (41–43) Country about 40 miles south-east of McDames creek; (44–47) Country about 30 miles south-east of McDames creek; (48) *Ovis Stonei* shot; (49) A "Hudson Bay bird" stealing meat from camp near McDames creek; (50–51) Indian from Fort Graham, near McDames creek; (52–56) Kaska Indians, McDames creek; (57) A Kaska woman on the Dease river; (58) A Kaska woman drying her winter's supply of ground-hog; (59) Indian method of preparing moose-skin; (60) Indian fishing village of Thaltan; (61) Lava beds and Indian grave, Thaltan; (62 and 63) Indian sweat-baths near Thaltan; (64) Indian camp and sweat-bath near Thaltan; (65) Indian cache near Thaltan; (66–68) Thaltan Indians; (69) Indian grave, Thaltan; (70–73) Indian graves, Telegraph creek; (74) Indian house, Telegraph creek; (75–78) Indians at the Hudson Bay Company's store, Telegraph creek; (79 and 80) Pack-dogs; (81) Thalton bear-dog and dead porcupine, Telegraph creek; (82) Two very large puff-balls near Telegraph creek.

British East Africa. **Neligan.**

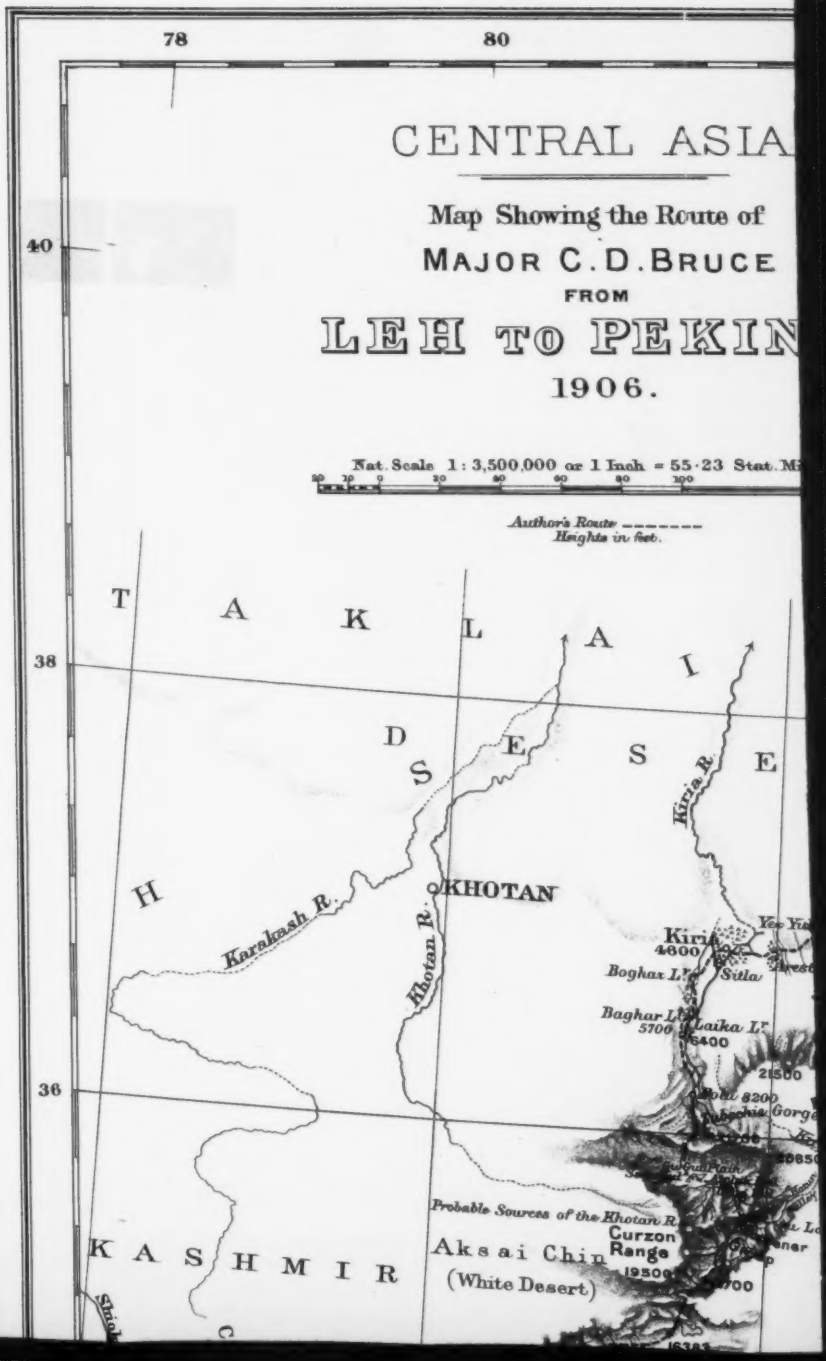
Photograph of Mount Kenya, from near Ngani Nguki river, taken by C. W. Neligan, Esq. *Presented by C. W. Neligan, Esq.*

This view is of exceptional interest, as the mountain is so frequently obscured by mist that it can be rarely photographed.

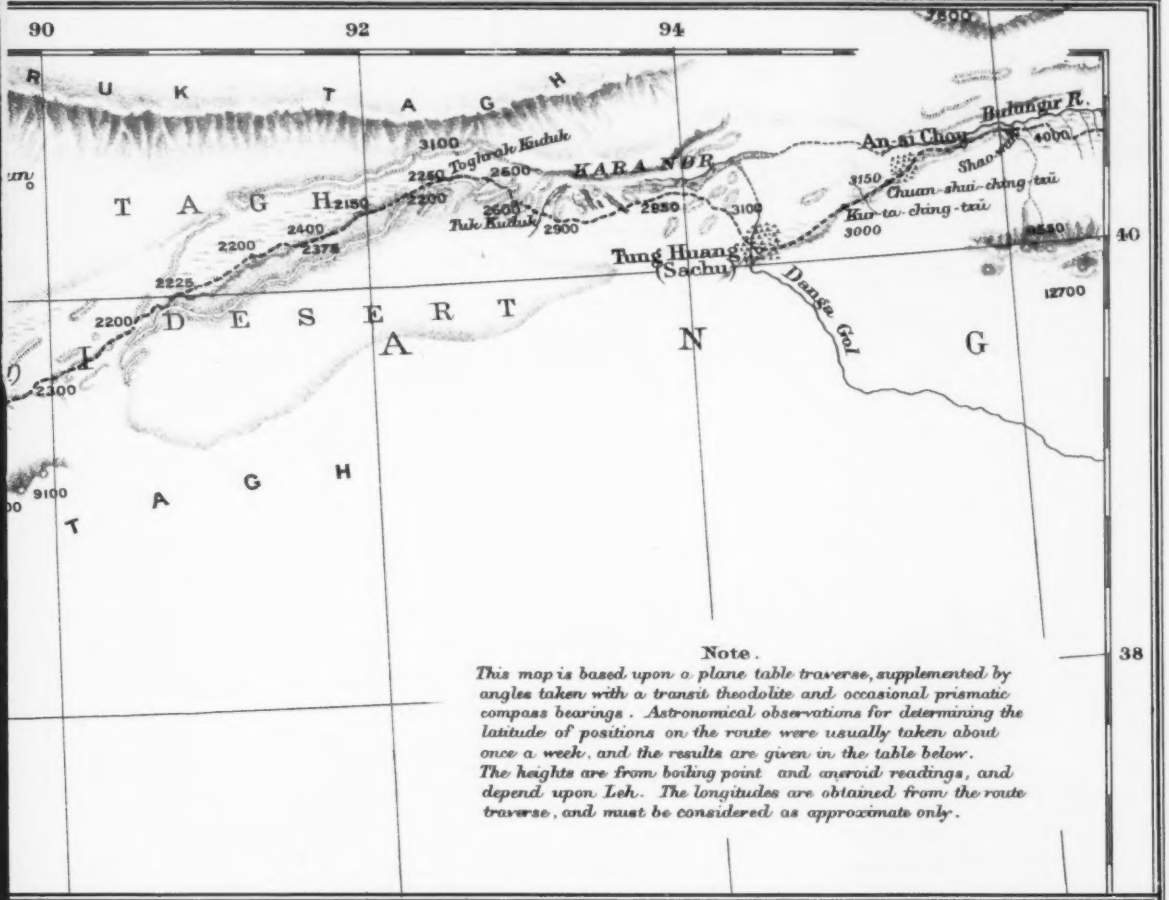
Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Vierte Reihe. Heft 7. Arizona, von Anton Purpus und Carl Albert Purpus. Heft 8. Wa[illegible]nd Bruchvegetation aus Mittel-Russland. Von A. Th. Fleroff. Jena: Gustav Fischer, 1907. *Price 2.50 M. each part.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

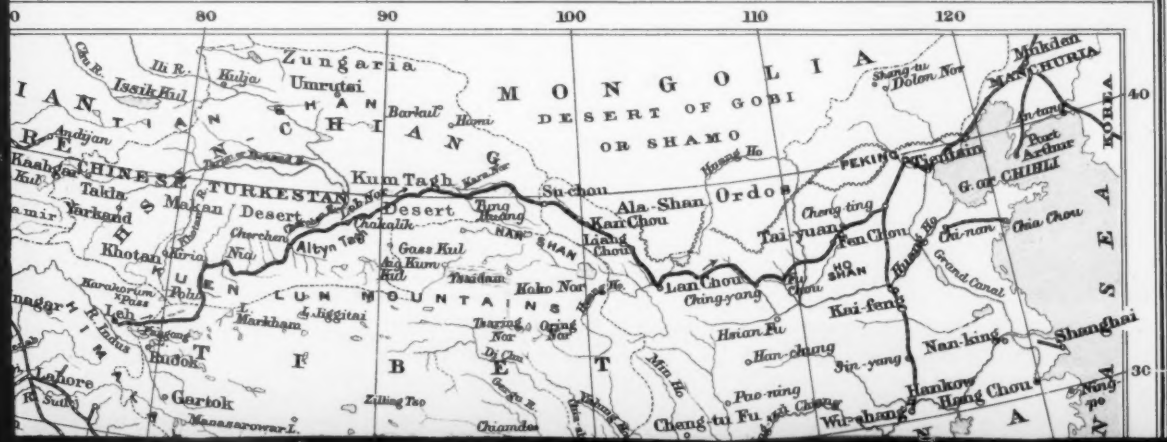

78
80
CENTRAL ASIA
Map Showing the Route of
MAJOR C. D. BRUCE
FROM
LEH TO PEKIN
1906.
Nat. Scale 1 : 3,500,000 or 1 Inch = 55·23 Stat. Mi
Author's Route
Heights in feet.
40
38
36
TAKLAI
DESE
H
KHOTAN
Karakash R.
Khotan R.
Kiria R.
Kiria
4600
Boghar L.
Sita
Baghar L.
5700
Laika L.
6400
21500
Probable Sources of the Khotan R.
Curzon
Range
19500
Aksai Chin
(White Desert)
KASHMIR

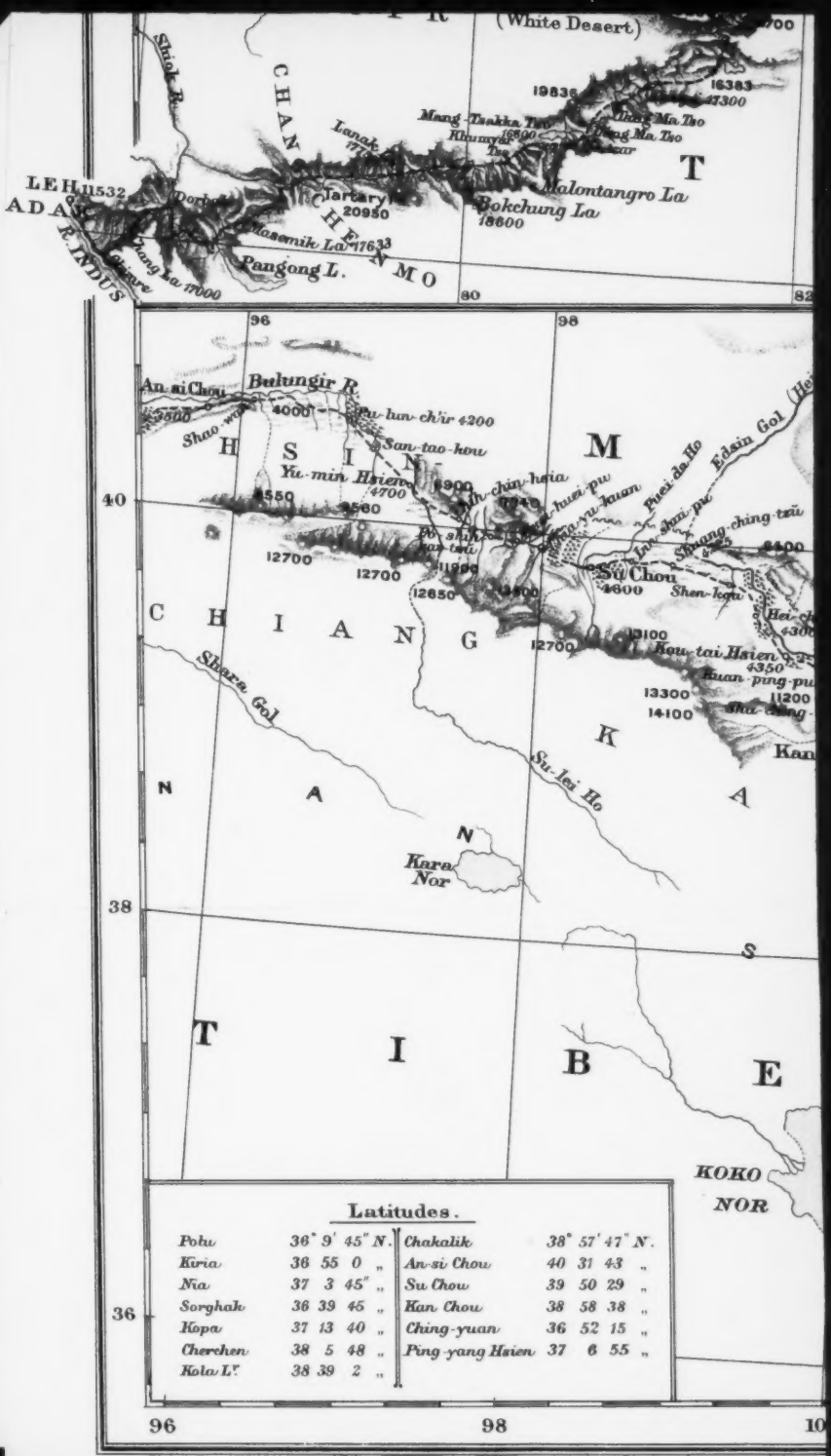
ASIA
ute of
RUCE
KING.
82
84
86
88
90
23 Stat. Miles.
150
Tarim or Yarkand R.
Tarim (South Channel)
Konche Darya
Tikkenlik
Lo Lan
K U R U
K U M
Khivillik Kul
LOB NOR
(Kara Koshun Kul)
Lob
Abdal
2300
2400
2550
Yundashkok
2600
9700
9100
Chakalik
3300
8050
16600
Chakalik R.
Tatlik bulak
Ushur
Khamlok
Kashak
2700
Kuh-shari
2600
2875
Akra
Toghrak
Chimen
Kuda
Cherchen R.
3450
3300
Askai
Kengdaka
3600
Ak Ding
9100
13300
Cherchen
4100
Yekdai
Uzun Takki
4700
Jong Sai
15300
13100
Razwai
17400
Sultan Tagh
Patkaklik R.
Baskia
Supa-tarq
17300
Achoma
18600
Takhas
Nowcba Pass
17560
Laona Chima Pass
12600
15950
Ak Su
Sera Sai 9800
15701
Nia
Yee Yulgun
Chakandik
Sitla
Sorghak
7500
Yulgun bulak
Tolan Khaja R.
Kara Sai R.
Ore Jak R.
Bugma
9400
Otto Sai R.
Mein R.
Kuruk
8000
Andere
Boston R.
Nia R.
Tarelak R.
Chaidan R.
Solpoga R.
Kogai R.
Yarkand R.
Bashmir R.
19600
Kuchia Gorge
Kuchia R.
9850
21500
8200
17750
70
40
RUSSIAN
EMPIRE
Samarkand
BOKHARA
Kara Kul
Amu Darya
Pamir
AFGHANISTAN
KABUL
Peshawar
Srinagar
Chaman
Quetta
Lahore
Multan
R. Jhelum
R. Chenab
R. Ravi
R. Sutlej
R. Indus



Note.

This map is based upon a plane table traverse, supplemented by angles taken with a transit theodolite and occasional prismatic compass bearings. Astronomical observations for determining the latitude of positions on the route were usually taken about once a week, and the results are given in the table below. The heights are from boiling point and aneroid readings, and depend upon Leh. The longitudes are obtained from the route traverse, and must be considered as approximate only.

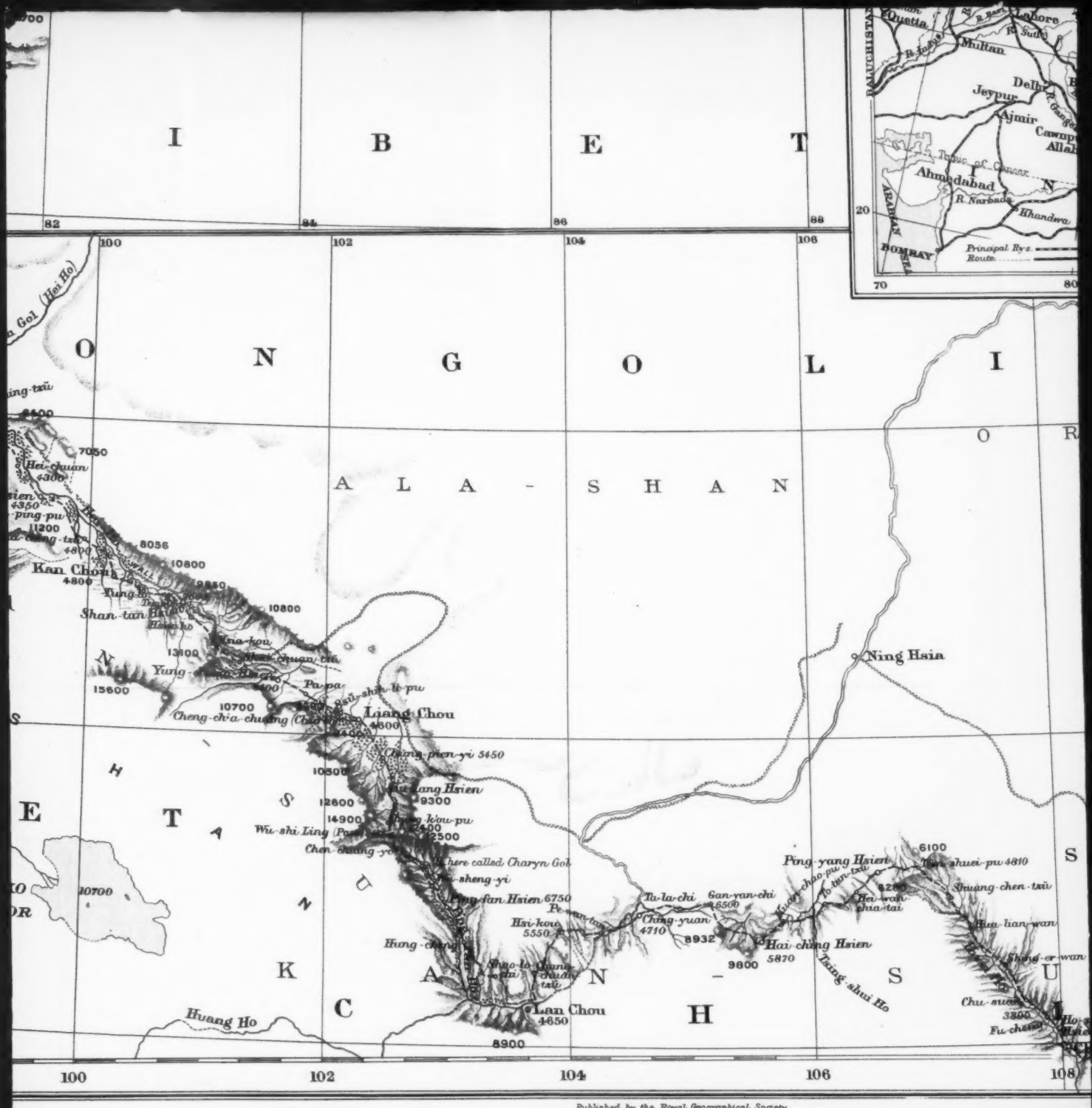




Latitudes.

Polu	36°	9′	45″ N.	Chakalik	38°	57′	47″ N.
Kiria	36	55	0 „	An-si Chow	40	31	43 „
Nia	37	3	45″ „	Su Chow	39	50	29 „
Sorghak	36	39	45 „	Kan Chou	38	58	38 „
Kopa	37	13	40 „	Ching-yuan	36	52	15 „
Cherchen	38	5	48 „	Ping-yang Hsien	37	6	55 „
Kola L^r	38	39	2 „				

Conical Projection with Standard Parallels 35° and 40°



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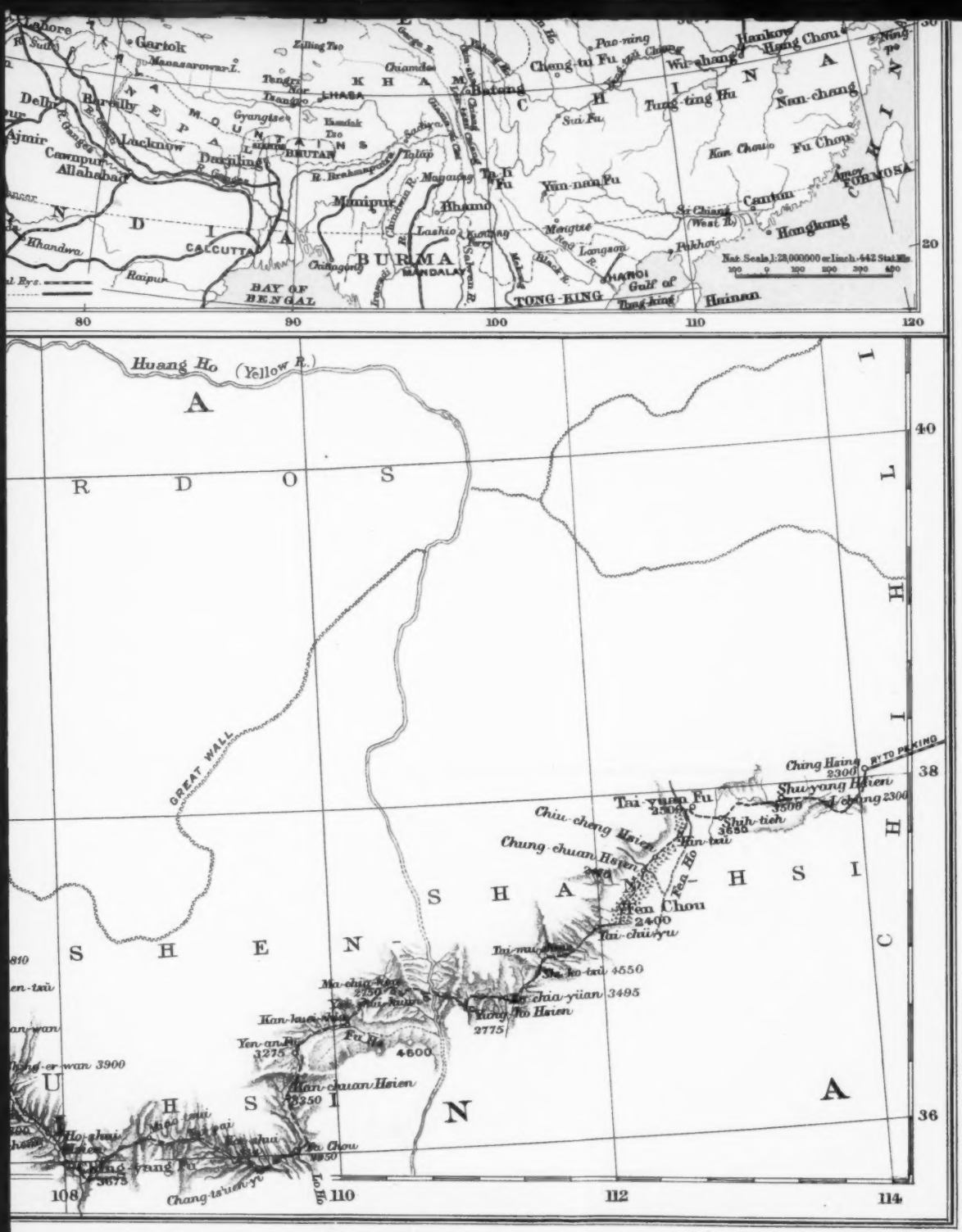
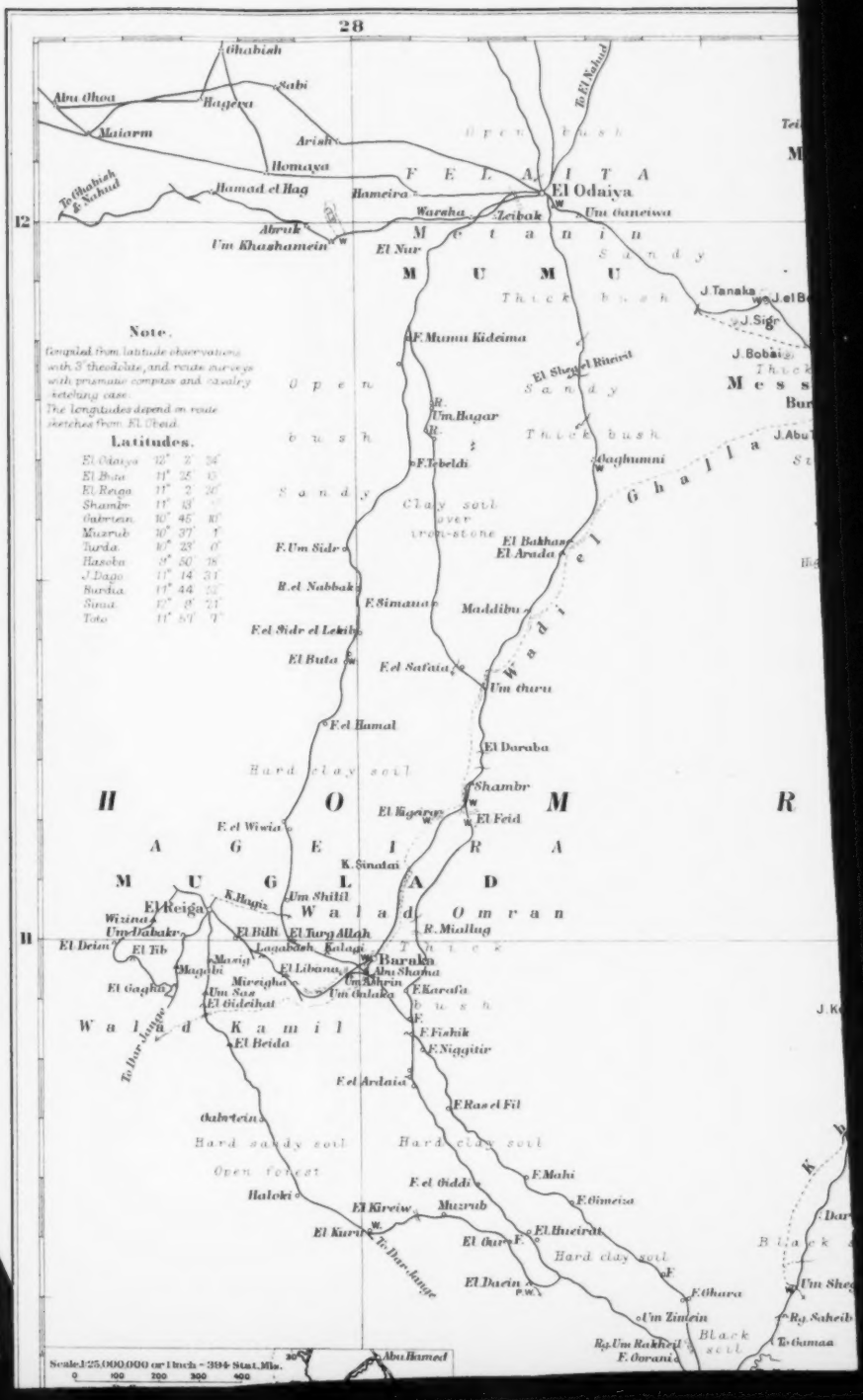
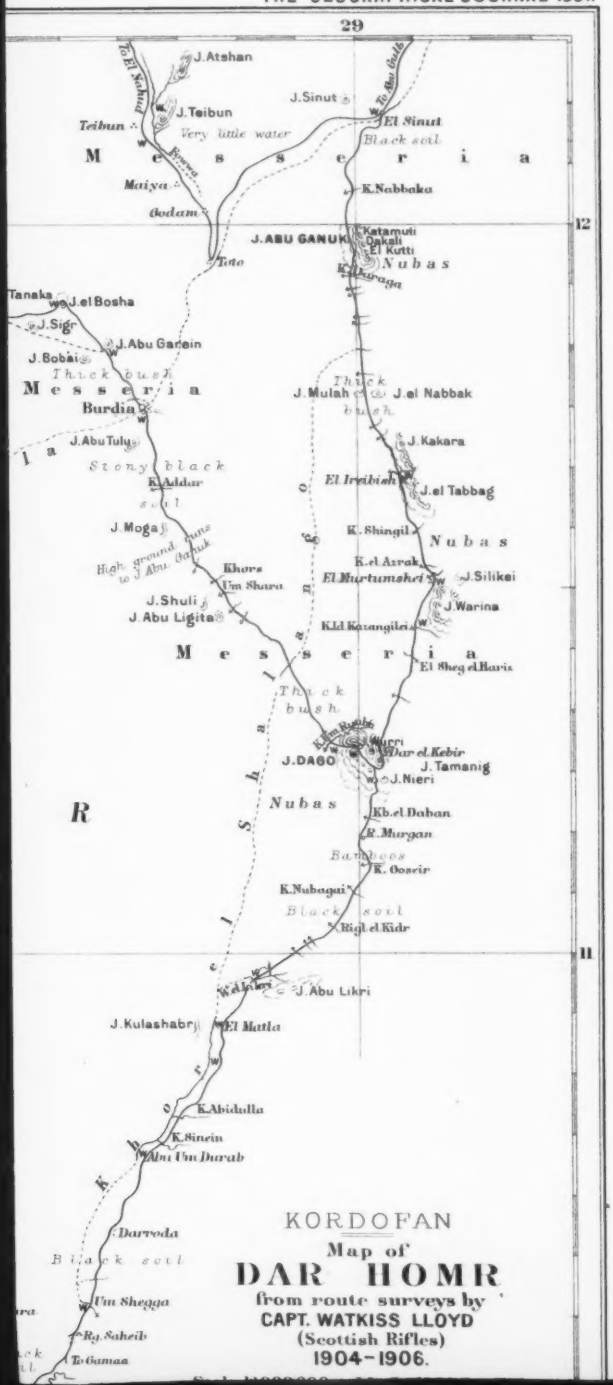

Lahore
Kartok
Manasarowar L.
Tengri Nor
LHASA
Gyangtse
Bamdak Tso
Sakya
Tsangpo R.
Chiamdo
Batang
Pao-ning
Chang-tu Fu
Wu-chang
Hankow
Hong Chou
Nong po
Delhi
Bareilly
Ajmir
Lucknow
Cawnpore
Allahabad
Darjiling
R. Ganges
HIMALAYA MOUNTAINS
BHUTAN
R. Brahmaputra
Tsiap
Manaung
Tu-li Fu
Yun-nan Fu
Tung-ting Hu
Nan-chang
Kan Chou
Fu Chou
Amoy
FORMOSA
Mimpur
Bhamo
Lashio
Kantung
Meigtse
Sz Chuan
Canton
West R.
Hongkong
Pakhoi
Langson
Black R.
Bhandwa
CALCUTTA
Chittagong
BURMA
MANDALAY
HANOI
Gulf of Tung-king
TONG-KING
Hainan
Raipur
BAY OF BENGAL
Nat. Scale 1: 23,000,000 or 1 inch = 442 Stat. Mls.
80
90
100
110
120
30
20
Huang Ho (Yellow R.)
GREAT WALL
R T O D O S
A
I L I H
S H A N - H S I
S H E N -
U S H S I N A
40
38
36
Chang Hsing 2300
R.R TO PEKING
Shuyang Hsien
Lochang 2300
Tai-yuan Fu 2500
3500
Shih-tien 3650
Chiu-cheng Hsien
Hun-tsui
Chung-chuan Hsien
Fen Ho
Yen Chou 2400
Tai-chai-yu
Ma-chia-kou 2750
Yeh-shan-kou
Kan-kuo-kou
Yen-an Fu 3275
Fu Ho 4600
Kan-chuan Hsien 2350
Ho-chai
Kao-chia
Ya Chou 1950
Ching-yang Fu 3675
Chang-ta-tien-yi
Lo Ho
Ta-ko-tai 4550
Ta-chia-yuan 3495
Kiang-To Hsien 2775
108
110
112
114


28
12
11
Ghabish
Abu Ghoa
Sabi
Hagera
Maiarm
Arish
Homaya
To Ghabish & Sahud
Hamad el Hag
Hameiva
El Odaiya
To El Nahud
Waraha
Zeibak
Um Gameiwa
Abruk
Um Khashameir
El Nur
F E L A I T A
M e t a n i n
M U M M U
Open bush
Sandy
Thick bush
Note.
Compiled from latitude observations with 3" theodolite, and route surveys with prismatic compass and cavalry reteking case.
The longitudes depend on route sketches from El Obeid.
Latitudes.
El Odaiya 12° 2' 34"
El Buta 11° 55' 15"
El Renga 11° 2' 26"
Shambr 11° 13' "
Gabrtein 10° 45' 10"
Muzrub 10° 37' 1"
Turda 10° 28' 0"
Haseba 9° 50' 18"
J Dago 11° 14' 31"
Surdia 11° 44' 52"
Sinat 12° 8' 21"
Toto 11° 51' 7"
J Tanaka
J. Sigr
J. Bobai
F. Mumu Kideima
El Shegal Rimint
R. Um Bagar
F. Tebeldi
Daghumni
Ghaila
Sandy
Clay soil over iron-stone
El Bakhara
El Arada
F. Um Sidr
R. el Nabbak
F. Simaua
Maddibu
F. el Sidr el Lekib
El Buta
F. el Safaia
Um Guru
F. el Hamal
El Daraba
Hard clay soil
Shambr
El Fegarra
El Feid
H O M R
E. el Wisia
A G E I R A
K. Sinatan
M U G L A D
El Reiga
K. Bugiz
Um Shilil
W a l a d O m r a n
Wizina
Um Dabakr
El Billi
El Turg Allah
R. Miullug
El Dein
El Tib
Logabash
Kalaga
Thick
Mareigi
Magabi
El Libana
Baraka
Abu Shama
El Gaghin
Mireigha
Um Saa
Um Adhrin
F. Karafa
Um Galaka
El Gideibat
bush
W a l a d K a m i l
F. Fishik
El Beida
F. Niggitir
To Dar Jange
F. el Ardaia
F. Ras el Fil
Gabrtein
Hard sandy soil
Hard clay soil
Open forest
F. el Giddi
F. Mahi
Haloki
El Kireiw
Muzrub
F. Gimeiza
El Kuru
To Dar Jange
El Gure
F.
El Hueirat
Hard clay soil
El Darein
F.
F. Ghara
Um Zimein
Black soil
Rg. Um Rakheit
F. Gorani
To Gamaa
Abu Hamed
Scale 1:25,000,000 or 1 inch = 394 Stat. Mls.
0 100 200 300 400


29
12
11
To El Nahud
J. Atshan
J. Sinut
To Abu Gubb
J. Teibun
Teibun
Very little water
El Sinut
Black soil
M e s s e r i a
Forest
Maiya
K. Nabbaka
Godam
J. ABU GANUK
K. Katamuti
Dakali
El Kutti
Toto
N u b a s
K. Buraga
Tanaka
J. el Bosha
J. Sigr
J. Abu Garein
J. Bobai
Thick bush
M e s s e r i a
Burdia
J. Mulah
J. el Nabbak
Thick bush
J. Abu Tulu
J. Kakara
Stony black soil
K. Addar
El Ireibieh
J. el Tabbag
J. Moga
K. Shingil
N u b a s
High ground runs to J. Abu Gabuk
K. el Azrak
Khors
Um Shura
El Murtumshri
J. Silikei
J. Shuli
J. Abu Ligita
J. Warina
K. el Kazangilei
M e s s e r i a
El Sheg el Baris
Thick bush
K. Um Rubeba
Murri
Dar el Kebir
J. DAGO
J. Tamanig
J. Nieri
R
Nubas
Kb. el Daban
R. Murgan
Bamboos
K. Oosvir
K. Nubagai
Black soil
Bigil el Kidr
J. Abu Likri
J. Kulashabri
El Matla
K. Abidulla
K. Sinein
Abu Um Durab
Darreda
Black soil
Um Shegga
Rg. Saheib
To Gamaa
KORDOFAN
Map of
DAR HOMR
from route surveys by
CAPT. WATKISS LLOYD
(Scottish Rifles)
1904-1906.

28

Ha

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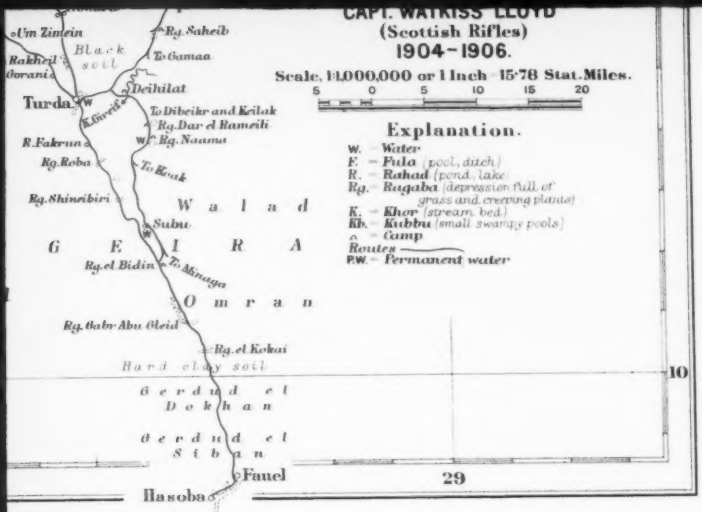

Royal Geographical Society

INDEX.

* Denotes Articles and Papers. † Bibliographical Entry.
§ Reviews and Notices.

A.

Abakaliki, Southern Nigeria, 60
Abdal, Chinese Turkestan, 612
Abendanon, E. C., Géologie du Bassin rouge de la province de Se-tchouan, 471†
Abruzzi, Duke of the, Snows of the Nile, 121 *
Abyssinia—
  Abyssinia of To-day: R. P. Skinner, 76 §
  Abyssinian agreement between Great Britain, France, and Italy, 225 §
  Accord Anglo-franco-italien à propos de l'Abyssinie, 358 †
  Agreement between the United Kingdom, France, and Italy, 225 §, 687 †
  Histoire de l'Éthiopie (Nubie et Abyssinie): L.-J. Morié, 105 †
  Maps: Schizzo dimostrativo delle principali concessioni per ricerche minerarie: C. Rossetti, 364 †
  Reise nach Kaffa und Da'ure: A. Freiherrn von Mylius, 687 †
  Sport and Travel: Abyssinia and British East Africa: Lord Hindlip, 104 †, 556 §
Accra, Gold Coast, longitude of, 225
Achá, J. A., Sud América. Problemas de vialidad continental, 586 †
Aconcagua—
  Ascent by Herr Heltling, 349
Acre—
  Maps: Karte des Acre-Gebiets, 116 †
Adam, F., Photographs of Malay Peninsula, 595 †
Adamović, L., Zur pflanzengeographischen Karte von Serbien, 85 §, 470 †
Adams, F. D., and O. E. Leroy, The Artesian and other Wells on the Island of Montreal, 584 †
Admiralty Charts, 117 †, 247 †, 366 †, 483 †, 593 †, 699 †
Admiralty Surveys during 1906: A. M. Field, 663
Adriatic—
  Flutmesser in Ragusa im Jahre 1905, Beobachtungen am, 355 †
  Österreichisches Forschungsschiff: C. J. Cori, 685 †
Afghanistan: A. Hamilton, 102 †
Africa—
  Boundary surveys, 552
Africa—*continued*.
  British East: Native Races: Sir C. Eliot, 358 †; Photographs: R. G. T. Bright, 119 †; E. M. Murray, 368 †; Sport and Travel: Abyssinia and British East Africa: Lord Hindlip, 104 †, 556 §
  Central: P. H. G. Powell-Cotton's expedition in, 346; Tra Mez-Afriko: C. Lemaire, 472 †
  Central African Lakes and Mountains, The most reliable Values of Heights of: T. T. Behrens, 307 *
  Chemins de fer Africains: L. Jacob, 358 †
  Colonial Reports, Annual: Surveys and Explorations of British Africa, 472 †, 550 §
  East: Trigonometrical points of principal stations, 265; Zauber des Elelescho: C. G. Schillings, 104 †
  East Africa Protectorate, Rainfall of: G. B. Williams, 654 *
  East Central: Mission Scientifique du Bourg de Bozas, 77 §
  Expedition across, B. Alexander's, 346
  French West: Binnenwasserstrassen in Westafrica zwischen Senegal und Niger: D. Kürchhoff, 104 †
  Geology of the Continent of Africa, Notes on the: A. Knox, 78 §
  German East:—
    Bericht über die Tätigkeit des Detachements des Majors Johannes 1905–1906..105 †
    Deutsche Njassa- und Ruwuma-Gebiet, Land und Leute: F. Fülleborn, 472 †
    Photographs: R. G. T. Bright, 119 †
    Regenbeobachtungen aus Deutschostafrika: C. Uhlig, 105 †
    Scientific expeditions under F. Jaeger and K. Weule, 88, 226, 457
    Vorsitzenden der Landeskundlichen Kommission über eine Reise nach dem Kibo: F. Jaeger, 226 §, 457 §, 688 †
    Wirtschaftliche Entwickelung Deutsch-Ostafrikas, 1885–1905: K. Most, 472 †
  German expedition across Africa, Proposed, 348

Africa—*continued.*
German South-West: Report on Boundary Survey between British Bechuanaland and German South-West Africa: Sir D. Gill and others: 106 †, 552 §; Nation der Bastards: — Bayer, 473 †; Zwischen Lüderitzbucht und Kubub: — Schulze, 473 †
Lakes of Central Africa, Fall in level of, letter on: A. Sharpe, 466
Lastenbeförderungsmittel in Africa: D. Kürchhoff, 687 †
Maps—
Afrique Occidentale Française, 697 †
Justus Perthes' Wandkarte von Afrika zur Darstellung der Bodenbedeckung: P. Langhans, 244 †
Karte von Deutsch-Ostafrika: P. Sprigade und M. Moisel, 481 †
Map of Africa (Top. Section, General Staff), 364 †, 591 †, 697 †
Railway Map of South Africa, 364 †
Schizzo dimostrativo della situazione politica nell' Affrica Orientale: C. Rossetti, 364 †
Schizzo dimostrativo delle vie di comunicazione fra l'Eritrea il Sudan e l'Etiopia: C. Rossetti, 115 †
Mineral Belt of South Central Africa, Report on, 90
Nordafrika (Mit Ausschluss des Nilgebietes) nach Herodot: R. Neumann, 447 §
North-East: Alte und neue Handelsstrassen . . . in Nordost-Afrika: D. Kürchhoff, 105 †
Périple d'Afrique: Du Cap au Zambèse et à l'Océan Indien: H. Cordier, 359 †
Photographs of British and German East Africa: R. G. T. Bright, 119 †
Portuguese East Africa: History . . . of Manica and Sofala: R. C. F. Maugham, 216 §, 473 †
Schiffahrt nach Afrika unter besonderer Berücksichtigung der deutschen Flagge: D. Kürchhoff, 358 †
South—
Briton, Boer, and Black, or Ten Years' Hunting . . . in South Africa: C. Handley, 473 †
Geodetic Survey, Report for 1905.. 551
Geological Reports, Recent, 68
Guide to South Africa for use of Tourists, etc.: A. S. and G. G. Brown, 106 †
Presidential Address, delivered to Geological Society of South Africa: F. H. Hatch, 238 †
South Africa as seen by a Meteorologist during Visit of British Association in 1905: H. R. Mill, 106 †
Survey work, Report of Astronomer at the Cape, 225
Tanganyika Concessions, Ltd.: Engineers' and Managers' Reports of Gold, Tin, and Copper Mines of Katanga, etc., 90 §, 583 †
West—
At the Back of the Black Man's Mind: R. E. Dennett, 106 †
Banks off the coast of, 576
Grenzfestsetzung zwischen dem deutschen Gebiete Nordwest-Kamerun und dem britischen Gebiete Nigeria, 238 †
Recherches sur l'histoire des migrations dans le bassin de l'Ogôoué et la région littorale adjacente: R. Avelot, 688 †
Treaty Series, Convention between the United Kingdom and France, 238 †
Wasserweg von Meerbusen von Guinea zum Tschadsee (Faure), 688 †
West African Warfare: C. B. Wallis, 359 †
Westafrikanische Nutzpflanzen: W. Busse, 120 †
Wild Animals in Africa, Correspondence relating to Preservation of, 472 †
Agaiambo tribe, British New Guinea, 92
Ailesworth, example of common field enclosure, 35
Ahlenius, Karl (Biography): J. G. Andersson, 693 †
Air—
Druck und Temperatur bewegter Luft: F. M. Exner, 476 †
Durchsichtigkeit der Luft bei verschiedenen Witterungszuständen in Wien: M. Samec, 476 †
Akoko hills, Southern Nigeria, 59
Alaska—
Glacial erosion in Alaska, R. S. Tarr's study of, 572
Maps: Alaska (U.S. General Land Office), 245 †; Karte von Alaska: H. Habenicht und C. Böhmer, 364 †
Mineral Resources of Alaska in 1905, Report on Progress of Investigations of: A. H. Brooks and others, 688 †
Photographs of Alaska and British Columbia: N. Maclaren, 700 †
Yakutat Bay Region, Recent Changes of Level in: R. S. Tarr and L. Martin, 584 †
Albania—
Albanie et la Chaîne du Pinde: M. David, 581 †
Maps: Utazások Éjszak Albaniában: Baron Nopcsa, 694 †
Vorstoss in die nordalbanischen Alpen: K. Steinmetz, 357 †
Albert, Lake, heights of, 318
Albert Edward, Lake, heights of, 318
Alberti, L., Descrittione di tutta Italia, 112 †
Alexander, B., Expedition across Africa, 346

Alexander, W. H., Climatology of Porto Rico from 1867 to 1905 .. 690 †
Alexander-Gosling Expedition, 97, 346
Alexandra peak, Ruwenzori, height of, 139
Alexandrina, Lake—
Who discovered Lake Alexandrina? J. Gill, 690 †
Algæ—
Distribution des Algues: algues fixées, algues du Plankton: L. Mangin, 476 †
Algeria—
Algiers and Beyond: M. W. Hilton-Simpson, 104 †, 447 §
Küstenstudien und Reiseeindrücke aus Algerien: T. Fischer, 583 †
Maps: Algérie et Tunisie: G. Niox, 591 †
Nomadisme en Algérie, L'Evolution du: A. Bernard et N. Lacroix, 104 †
Almanac—
Pearson's Nautical Almanac and Tide Tables, 1907: W. R. Kettle and H. D. Jenkins, 587 †
Almanzora, Valley of—
Map of, with portion of Provinces of Jaen, Granada, etc.: G. Gillman, 695 †
Alps—
Charles the Great's passage across the Alps, W. A. B. Coolidge on, 455
Unterirdisch entwässererte Gebiete in den nördlichen Kalkalpen: M. Hoffer, 685 †
Weather-parting, Alps as a, H. von Ficker's studies on, 84
Alsace—
Sundgauer Hügelland im Ober-Elsass: L. G. Werner, 100 †
Amazon—
Arboreticum Amazonicum: J. Huber, 585 †
Ambronn, L., Bericht über die astronomischen und geodätischen Aufnahmen, welche zum Zwecke der Grenzregulierung zwischen Kamerun und dem Congo-Français, 474 †
America—
Carte d'America di Giacomo Gastaldi: South Grande, 670 §
America, Central—
Amerika-Wanderungen eines Deutschen: J. Wilda, 108 †
Vulcangebieten Mittelamerikas und Westindiens, In dem: K. Sapper, 558 §
America, North—
Maps: Stanford's New Orographical Map of North America: H. J. Mackinder, 592 †
America, South—
Deutsche Kolonisation in Südamerika: H. Klössel, 475 †
Ergebnisse meiner südamerikanischen Reisen, Bericht über die: M. Uhle, 239 †
America, South—*continued*.
Expedition into Interior, under W. C. Farabee, 229
Fouilles de la mission scientifique française à Tiahuanaco: Comte G. de Créqui-Montfort, 239 †
Maps: Spezialkarte von Santa Catharina, Rio Grande do Sul, und Uruguay: R. Jannasch, 482 †
Panama to Patagonia: C. M. Pepper, 108 †
Panama and Magellan routes to Western South America, A Comparison of the, 586 †
Problemas de vialidad continental: J. A. Achá, 586 †
Amundsen, R., Medal awarded to, 567; To the North Magnetic Pole and through the North-West Passage, 485 *; Voyage by the North-West Passage, Results of, 231
Anderson, W., Geological Survey of Natal and Zululand, Reports, 71 §, 72
Andersson, J. G., Entwickelungsgeschichte der skandinavischen Flora, 581 †; Karl Ahlenius, 693 †; On the Geology of Graham Land, 586 †, 668 §
Andes—
Hoch-Anden von Ecuador: In den: H. Meyer, 558 §
Andrews, E. C., Molybdenum, 360 †
Andrimont, R. d', La science hydrologique; ses méthodes, etc., 476 †
Anglesey—
Cefni River in Anglesey: E. Greenly, 238 †
Angmagsalik, East Greenland, 232
Angul Nor lake, Southern Mongolia, 191
Anjar, Cutch, 521
Année Cartographique: F. Schrader, 116 †
Antarctic—
Belgian Expedition, Proposed Second, under M. Arctowski, 575
Botany of the, its present and future problems: R. N. R. Brown, 586 †
British Expedition: Logs of the s.s. *Discovery* (4 vols.), 361 †
Expeditions: J. B. Charcot's proposed, 464; New British Expedition: E. H. Shackleton, 329
French Expedition: Journal de l'Expédition antarctique française 1903–1905. Le "Français" au Pôle Sud: J. B. Charcot, 361 †, 450 §
Georgia Australe, Di una carte nautica inedita della: A. Faustini, 587 †
Grahamland, On the Geology of: J. G. Andersson, 586 †, 668 †
Ice-cap: H. T. Ferrar, 690 †
Scotia, Voyage of the: R. C. Mossman, J. H. Pirie, and R. N. R. Brown, 78 §
Scottish National Expedition: Report on Work of the: W. S. Bruce, 361 †; Some Meteorological Results: R. C. Mossman, 586 †
Südgeorgien, Vegetationsbilder . . . von: C. Skottsberg, 120 †

Antarctic—*continued.*
South Georgia, Contributions to the Fauna of: E. Löanberg, 690 †
Vegetation of the Antarctic Sea, Observations on the: C. Skottsberg, 690 †
Anthoine, E.: *see* Schrader, F.
Anthropogeography—
Influence du milieu géographique sur le développement de la taille humaine: E. Pittard, 692 †
Anthropology—
Anthropological Photographs, 477 †
Situazione e spazio delle provincie antropologiche nel mondo antico: R. Biasutti, 589 †
Antigua—
Sugar Industry in Antigua and St. Kitts, Report on: F. Watts, 239 †
Arab and Druze at home: W. Ewing, 454 §, 472 †
Arabia—
Chevalier d'Arvieux's Travels in Arabia the Desart, 112 †
England in Arabia: — Kleist, 472 †
Hedschasbahn: Auler Pascha, 103 †
Maps: Karte von Arabia Petraea: A. Musil, 345 §, 243 †
Aral sea—
Russian Hydrographical Surveys, 639
Archæological discoveries near Turfan, Dr. von Lecoq on, 224
Arctic—
Bottom Deposits of the North Polar Sea: O. B. Bøggild and others, 109 †
Canadian Expedition to the Northern Archipelago under J. E. Bernier, 93
Canadian for the Pole, A, 109 †
Expédition en ballon dirigeable, projetée pour l'exploration du Pôle Nord: M. J. Janssen, 109 †
Expeditions: R. Amundsen's, Results, 231; E. Mikkelsen's, 463; R. E. Peary's, 97, 575
Hydrography of Waters North of Iceland, Contributions to: J. N. Nielsen, 587 †
Ice in the Arctic Seas, State of, 1905: V. Garde, 109 †
Northern Waters: F. Nansen, 690 †
North Magnetic Pole and through the North-West Passage, To the: R. Amundsen, 485 *
Swedish Expedition: Astronomische . . . Arbeiten von der Schwedischen Polarexpedition 1898: A. Hamberg, 361 †, 587 †; Hydrographische Arbeiten der von A. G. Nathorst geleiteten schwedischen Polarexpedition 1898: A. Hamberg, 690 †
Travel, Arctic, Notes and Suggestions on: A. P. Low, 587 †
Arctowski, H., Proposed Second Belgian Antarctic Expedition, 575; Polar Problems and the International Organization for their Solution, 691 †
Ardouin-Dumazet, —, La Frontière Lorraine, 580 †
Argand, E.: *see* Lugeon, M.
Argentine—
Argentinien als Wirtschafts- und Auswanderungsgebiet: R. Jannasch, 585 †
Cadillal, El dique de embalse del: C. Wauters, 689 †
Problemas geográficos del Territorio Argentino: E. A. S. Delachaux, 585 †
Ariège—
Aude et l'Ariège: L. Farges, 356 †
Arizona—
Glaciation in Southern Arizona and Northern Sonora, Evidences of: F. J. Merrill, 474 †
Salt River Irrigation Project, 407
Arldt, T., Grundgesetze des Erdreliefs, 588 †; Namen der ozeanischen Inselgruppen, 690 †; Parallelismus auf der Erdoberfläche, 361 †; Parallelismus der Inselketten Ozeaniens, 475 †
Armenia—
Geology of Armenia, A Treatise on the: F. Oswald, 357 †
Arno—
Schwemmlandküste des Arno: R. Hunger, 101 †, 232 §
Arppe, W.: *see* Wijkberg, M.
Artaria's Eisenbahn- und Postkarte von Oesterreich-Ungarn, 362 †
Arvieux, Chevalier d', Travels in Arabia the Desart, 112 †
Asbeck, Baron van, probable course of Barents in Spitsbergen, 661–663
Ashford, W. H. R.: *see* Forbes, U. A.
Ashley, G. H., Geological prelude to the San Francisco earthquake, 474 †; and L. C. Glenn, Geology and Mineral Resources of . . . Kentucky, 107 †
Asia—
Central: E. Huntington's exploration of Lob Nor Region, 674; Is Central Asia drying up? L. Berg, 350 §, 582 †; Reiseskizzen aus Central-Asien: J. Prinz, 471 †, 686 †
East: Cinq lettres inédites du Père Gerbillon, missionaire français à Peking: H. Cordier, 687 †; Ostasiatischer Erdbebenkatalog: E. Rudolph, 357 †
Expeditions: Sven Hedin's, 456; V. A. Obrucheff's, 457; M. Pelliot's, 87, 223; M. A. Stein's, 31
Journey across Asia from Leh to Peking: C. D. Bruce, 597 *
Rainfall: Pluies de mousson en Asie: C. Passerat, 582 †
Reise durch Vorderasien im Jahre 1904: E. Zugmayer, 454 §
Vorderasien, Verkehrswege und Verkehrsprojekte in: M. Schlagintweit, 472 †
Asia Minor—
Gletscher am Erdschias-Dagh in Kleinasien: A. Philippson, 103 †
Maps: Karte von Kleinasien: R. Kiepert, 114 †

Asiatic Turkey—
Photographs of: H. E. W. Young, 118 †
Photographs of Asiatic Turkey and Persia: H. W. Cadoux, 119 †
Astronomy—
Introduction to Astronomy: F. R. Moulton, 109 †
Atchik Kul, salt lake, Tibet, 603
Atlantic—
Atlantique, mer inexplorée: O. Pettersson, 239 †
Maps: Meteorological Chart of North Atlantic and Mediterranean (Met. Office, London), 118 †, 248 †, 368 †, 483 †, 595 †, 700 †; Pilot Chart of North Atlantic (U.S. Hydrographic Office), 248 †, 368 †, 483 †, 595 †
Atlas mountains, Formation of, 448
Atlases—
Année Cartographique: F. Schrader, 116 †
Atlas Novus Terrarum Orbis Imperia Regna et Status exactis tabulis geographicé demonstrans: J. B. Homann, 113 †
Atlas Universel de Géographie: V. de St. Martin et F. Schrader, 246 †
Austria, Historical Atlas of Alpine Provinces of, Note on, 673
Géographie Historique, Atlas de: F. Schrader, 593 †
Géographie moderne, Atlas de: F. Schrader, F. Prudent et E. Anthoine, 593 †
Grosser Deutschen Kolonialatlas: P. Sprigade und M. Moisel, 245 †
Harmsworth Atlas and Gazetteer, 116 †, 246 †, 365 †, 482 †, 593 †, 698 †
Historischer Schul-Atlas zur alten, mittleren und neuen Geschichte: F. W. Putzger, 366 †
M. P. Atlas: W. & A. K. Johnston, 246 †
Philips' Handy-Volume Atlas of the World: E. G. Ravenstein, 593 †
Philips' Progressive Atlas of Comparative Geography: P. H. L'Estrange, 365 †
Stielers Hand Atlas, 117 †, 246 †, 366 †, 482 †, 593 †, 698 †
World's Commerce, Atlas of the: J. G. Bartholomew, 116 †, 246 †, 365 †, 592 †
Atmosphere—
Diurnal periods in the lower strata of the atmosphere, Studies on the: F. H. Bigelow, 110 †
Aubrac—
Plateau d'Aubrac: P. Buffault, 83 §, 356 †
Aude—
Aude et l'Ariège: L. Farges, 356 †
Auden, G. A., Handbook to York and district, 238 †
Audoin, —, and — d'Adhémar, Surveys of connection between Benue and Shari basins, 571
Aufsess, O. Frhr. v. u. z., Eine photographische Methode zur Bestimmung des Eindringens der Wärmestrahlung in einer See, 476 †
Aulagen, O., Zur Frage der Luftspielungen, 110 †
Auler Pascha, Die Hedschasbahn, 103 †
Aurora—
Aurore boréale, Sur l': P. Villard, 110 †
Australasia—
"Lloyd" Guide to Australasia: A. G. Plate, 108 †
Australia—
Coming of the British to Australia: L. Lee, 667 §
Fishes of Australia: D. G. Stead, 690 †
Murchison and Davenport Ranges, A. A. Davidson on characteristics of, 229
Murrumbidgee valley Irrigation scheme, 230
Native Races of the British Empire. Natives of Australia: N. W. Thomas, 108 †, 450 §
South: John A. Horrocks' *Journal*, 690 †; Meteorological Observations made at Adelaide Observatory during 1902-1903: C. Todd, 239 †; Report of F. R. George on Prospecting Expedition North of Nullarbor Plains, 475 †; Who discovered Lake Alexandrina? T. Gill, 690 †
Western: Journey across, by A. W. Canning, 678; On Pearl-fishing in N.-W. Australia: W. J. Sowden, 690 †; Pflanzenwelt von West-Australien südlich des Wendekreises: L. Diels, 239 †
Austria—
Historical Atlas of Alpine Provinces of, Note on, 673; Karstphänomens, Ein Beitrag zur Kenntnis des: I. V. Daneš, 685 †
Limnological station at Schloss Seehof, 222
Seichesbeobachtungen an den grösseren Seen des Salzkammergutes: A. Endrös, 685 †
Austria-Hungary—
Maps: Artaria's Eisenbahn- und Postkarte von Oesterreich-Ungarn, 362 †; Wolfgang Lazius Karten der österreichischen Lande und des Konigreichs Ungarn aus den Jahren 1545-1563: E. Oberhummer und F. R. von Wieser, 362 †
Avelot, R., Recherches sur l'histoire des migrations dans le bassin de l'Ogôoué et la région littorale adjacente, 460 §, 688 †
Azores—
Map: Carta chorographica da Ilha Terceira, 698 †
Azov Sea—
Russian Hydrographical Surveys, 632, 644

B.

Baba Hatun valley, 602
Babylonia—
Ethnologie des alten Orients. Babylonien und Chaldäa: F. Hommel, 103 †
Baedeker, K., Handbook for Travellers. Dominion of Canada, with Newfoundland, 474 †
Bahia, position of, 574
Bahr-el-Ghazal—
Maps: Map of the Bahr-el-Ghazal (Topographical Section, General Staff), 364 †
Baikal, Lake—
Russian Hydrographical Surveys, 639
Bailey, S. J., New Peruvian Route to the Plain of the Amazon, 585 †
Baines, Sir A., remarks on "Cutch and the Ran," 538
Baker, Mount, Ruwenzori, 140, 460
Balaton, Lake—
Wissenschaftlichen Erforschung des Plattensees, Resultate der, herausgegeben von der Plattensee-Commission der ung. geogr. Gesellsch., 554 §
Baldwin-Wiseman, W. R., Flow of Underground Water, 588 †
Balfour, A., Second Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum, 583 †
Balkan Peninsula—
Geography and Geology of Macedonia, etc.: J. Cvijić, 469 †
Ball, F. M., Present day climates in their time relation, 691 †
Baltic Coasts—
Land- und Seewinde an der Deutschen Ostseeküste: M. Kaiser, 580 †
Baltic Sea—
Russian Hydrographical Survey, 628, 644
Tätigkeit der Kommission C2 (Geschäfts-führer C. J. Petersen) in den Periode Feb. 1903—März 1906, Bericht über die, 685 †
Baltistan—
Summer Ride through Western Tibet: J. E. Duncan, 75 §
Banda—
First Expedition of the Portuguese to Banda: J. R. McClymont, 687 †
Bangweulu lake, Rhodesia, 372
Baratta, M., Sulla distribuzione topografica dei terremoti nel Chili, 462 §, 689 †
Barbadoes—
Voyage au pays du cacao et du sucre de canne: T. Dufau, 690 †
Baren, J. van, De Vormen der Aardkorst, 588 †
Barents' probable course in Spitsbergen as laid down by Baron van Asbeck, 661–663
Barometer—
Storia del Barometro, Contributo alla: P. T. Bertelli, 588 †
Barometric Variations of Long Duration over Large Areas: W. J. S. Lockyer, 110 †
Barré, P., Territoire français de Kouang-tchéou, 686 †
Barrell, J., on Mud-cracks as a Criterion of Sedimentation, 351
Bartholomew, J., Contour motoring map of the British Isles, 479 †; Reduced Survey Maps of the Channel Islands, 694 †; Tourists' Map of Egypt and the Lower Nile, 244 †
Bartholomew, J. G., Atlas of the World's Commerce, 116 †, 246 †, 365 †, 592 †; Map showing Surface Geology of Ireland, 243 †; Thacker's Reduced Survey Map of India, 244 †
Baudesson, —, Deux ans chez les Moïs, 358 †
Bauer, L. A., Magnetic Survey of the North Pacific Ocean; Instruments, Methods, and Preliminary Results, 240 †
Bavaria—
Kryptovulkanische Becken von Steinheim: W. Branco und E. Frass, 100 †
Schliersee, Der: J. Jaeger, 100 †
Bawenda, a Sketch of their History and Customs: E. Gottschling, 238 †
Bayer, —, Die Nation der Bastards, 473 †
Beacom, J. H., Irrigation in the United States: its Geographical and Economical Results, 400 *
Beatus map—
Manuscritos de los Comentarios al Apocalipsis de San Juan por San Beato de Liébana: A. Blázquez, 477 †
Beaufort sea, Ice in, 464
Beazley, C. R., Dawn of Modern Geography, vol. 3. History of Exploration, etc., 81 §, 111 †; Grant awarded to, 567
Bechuanaland—
Boundary between British Bechuanaland and German South-West Africa, Report, 106 †, 552 §
Underground Water in South-East Bechuanaland: A. L. du Toit, 358 †
Beechey island, Arctic America, 491
Beekman, A. A., De Vloed van 12 Maart 1906 in Zeeland, 101 †
Behrens, T. T., The most reliable values of Heights of Central African Lakes and Mountains, 307 †
Beira—
Proposed Railway from, to the Zambezi, 458
Belgium—
Étude phytogéographique de la zone maritime belge, Contribution à: C. de Bruyne, 580 †
Maps: Carte de la Flandre Occidentale (Institut Cartographique Militaire), 479 †
River-system of Belgium, M. Briquet on Evolution of, 567

Bell, G. L., The Desert and the Sown, 445 §, 472 †
Bell, J. M., A Physiographic Section through the Middle Island of New Zealand, 108 †
Bengal, Bay of—
New Island in the Bay of Bengal: E. J. Headlam, 430 *
Benin sands, height of, 62
Benndorf, H., Ueber die Art der Fortpflanzung der Erdbebenwellen im Erdinnern, 476 †
Benue—
Connection between Benue and Shari Basins, Surveyed by Lieut. Audoin and Captain d'Adhémar, 571
Berg, L., Is Central Asia drying up? 350 §, 582 †
Berger, H., Die ältere Zonenlehre der Griechen, 478 †
Berget, A., Les Courants marins—Le Gulf-Stream, 240 †; La houle et les vagues, 476 †
Beringer, O. L., North-Eastern Rhodesia. Provisional Map, 591 †; Surveys in Rhodesia, 388
Berkshire—
Highways and Byways in Berkshire: J. E. Vincent, 102 †
Maps: Ordnance Survey sheet showing Schools. Prepared for County Education Committee, 480 †
Bernard, A., et N. Lacroix, L'Evolution du Nomadisme en Algérie, 104 †; La Pénétration Saharienne (1830-1906), 106 †
Bernese Oberland—
Colonies Vallaisannes de l'Oberland Bernois: W. A. B. Coolidge, 581 †
Bernier, J. E., Canadian Expedition to the Northern Archipelago, 93
Bertelli, P. T., Contributo alla Storia del Barometro, 588 †
Bertolini, G. L., Note alla Carta del Territorio Trevigiano nell' Atlante Magini, 101 †
Betz, —, Eine Reise in Szechuan von Chungking über Land nach Chengtu, etc., 582 †
Beverley, W. H., Elements of Lithography and Sun-printing, 587 †
Bhadresvar, Cutch, 521
Bhotias of Almora and British Garhwal, Notes on the: C. A. Sherring, 582 †
Bhuj, Cutch, 521
Bhutan—
Geology of, G. Pilgrim's observations on, 86
Bianchi, F., Ricerche su un laghetto alpino (il lago Deglio), 101 †
Biasutti, R., Situazione e spazio delle provincie antropologiche nel mondo antico, 589 †
Bibliography—
Annales de Géographie. XV^e Bibliographie Géographique Annuelle, 1905.. 589 †
Bielefeld, R., Die Geest Ostfrieslands, 685 †
Bigelow, F. H., Studies on the Diurnal Periods in the lower Strata of the Atmosphere, 110 †
Bighorn mountains, Geology of: N. H. Darton, 689 †
Bihunga, Uganda, 132
Bird, Isabella (Mrs. Bishop), Life of: A. M. Stoddart, 111 †, 452 §
Bishop, Mrs. [J. F.]: *see* Bird, Isabella
Bismarck archipelago—
Neu-Mecklenburg (Bismarck-Archipel): E. Stephan und F. Graebner, 475 †
Südseekunst. Beiträge zur Kunst des Bismarck-Archipels und zur Urgeschichte der Kunst überhaupt: E. Stephan, 475 †
Bistümer Verden—
Grenze der Bistümer Verden und Halberstadt von der Elbe bis zur Ohre: J. Langer, 580 †
Blache—
Ancien cañon de la Blache et les vallées mortes du Gapençais: D. Martin, 580 †
Black sea—
Oberflächenströmungen des Schwarzen Meeres: W. Wissemann, 240 †
Russian Hydrographical Surveys, 632, 644
Blackmore Country: F. J. Snell, 470 †
Blagden, C. O.: *see* Skeat, W. W.
Blanchard, R., La Flandre: Étude géographique de la Plaine Flamande, 102 †
Blazquez, A., Los Manuscritos de los Comentarios al Apocalipsis de San Juan por San Beato de Liébana, 477 †
Blessich, A., L'ultima relazione sulla Somalia Italiana meridionale, 105 †
Blind, K., Homeric Knowledge of the High North, 111 †
Blümcke, A., and S. Finsterwalder, Die Gletscherbewegung mit Berücksichtigung ihres senkrechten Anteiles, 110 †
Boas, F., and G. Hunt, Kwakiutl Texts, 359 †
Boeck, K., Aux Indes et au Népal, 358 †
Bøggild, O. B., and others, On the Bottom Deposits of North Polar Sea, 109 †
Bogoslov Islands, Bering Sea, Notes on: D. S. Jordan and G. A. Clark, 228
Bohemia—
Geomorphologische Studien in den Tertiärbecken Südböhmens: J. V. Daneš, 685 †
Böhmer, C.: *see* Habenicht, H.
Bolivia—
Fronteras con la República del Peru, Allegato de parte del Gobierno de Bolivia en el Juicio Arbitral de, 360 †
Fronteras con la Republica del Peru, Defensa de los Derechos de Bolivia ante el Gobierno Argentino en el Litigio de: B. Saavedra, 360 †

Bolivia—*continued.*
Frontier between Bolivia and Brazil, Survey by P. H. Fawcett, 574
Indios Mosetenes y su lengua: S. A. L. Quevedo and P. N. Armentia, 689 †
Quinientas Leguas a traves de Bolivia: J. E. Zalles, 689 †
Boothia Felix, Arctic America, 492
Börgesen, F., Algenvegetationsbilder von der Küsten der Färöer, 248 †
Botero, G., Le Relationi Universali di, 112 †; "Relazione Universali" di Giovanni Botero e le Origini della Statistica e dell' Antropogeografia: A. Magnaghi, 589 †
Bottègo peak, Ruwenzori, height of, 140
Boule, M., L'âge des derniers Volcans de la France, 100 †
Boulenger, G. A., Report on Collection of Fishes made by W. A. Cunnington during Third Tanganyika Expedition, 687 †
Bourdon, H., Catastrophe de Valparaiso, 689 †
Bourge, G., Les Nouvelles Hébrides de 1606 à 1906..475 †
Bouvier, —, Giard. —, et — Laveran, Mission d'Études de la Maladie du Sommeil, 589 †
Bower, Colonel, remarks on "A Journey across Asia from Leh to Peking," 624
Bozas, Du Bourg de, Mission Scientifique. De la mer Rouge à l'Atlantique à travers l'Afrique tropicale, 77 §
Bracciolini, P., und Nicolò de Conti in ihrer Bedeutung für die Geographie des Renaissancezeitalters: W. Sensburg, 589 †
Bracconi, P., Colonisation française à Tahiti, 239 †; Les îles Sous-le-Vent de Tahiti et le régime de l'indigénat, 586 †
Bradley-Birt, F. B., Romance of an Eastern Capital, 102 †, 454 §
Bradshaw, G., Map of Canals, Navigable Rivers, Railroads, etc., in Midland Counties of England, 113 †; Map of Canals situated in Counties of Lancaster, York, Derby, and Chester, 113 †
Branco, W., and E. Fraas, Kryptovulkanische Becken von Steinheim, 100 †
Brandis, D., Indian Trees, 102 †
Braun, G., Eiswirkung an Seeufern, 577 §, 588 †; Gruppe der Legiener Seen, 580 †; Ueber ein Stück einer Strandebene in Island, 101 †
Bray, W. L., Vegetation of the Sotol Country in Texas, 585 †
Brazil—
Frontier between Bolivia and Brazil. Survey by P. H. Fawcett, 574
Maps: Rio Jauapery (Brasilien): R. Payer, 115 †
Serra do Espinhaço: O. A. Derby, 360 †
Breitfuss, L. L., Aperçu sur l'Expédition Scientifique pour l'exploration des Pêcheries de la Côte Mourmane, 581 †
Brenan, B., Remarks on "Nine Years' Survey and Exploration in China," 304
Brest—
Longitude de Brest, Application du téléphone . . . à la détermination de la: E. Guyou, 99 †
Bretscher, K., Zur Geschichte des Wolfes in der Schweiz, 84 §, 237 †
Brigham, A. P., Fiords of Norway, 236 †; Norwegian Landslip, 469 †
Bright, R. G. T., Photographs of British and German East Africa, 119 †; remarks on "From the Victoria Nyanza to Kilimanjaro," 271; Survey for Western Boundary of Uganda, 88
Brillouin, M., Les courbures du geoïde dans le tunnel du Simplon, 587 †
Briquet, M., on evolution of River-system of Belgium, 567
Britain: *see* United Kingdom
British Colonies—
Historical Geography of the British Colonies: C. P. Lucas, 478 †
British Columbia—
Kwakiutl Texts: F. Boas and G. Hunt, 359 †
Lillooet Indians: J. Teit, 359 †
Photographs of Alaska and British Columbia: N. Maclaren, 700 †
Rossland, B.C., Mining District, Preliminary Report on the: R. W. Brock, 584 †
Selkirk Range, vol. 2: A. O. Wheeler, 688 †
British Empire—
Britische Weltreich: K. Dove, 112 †
British Empire in its true proportions: S. Smith, 693 †
British Colonization and Empire, Lectures on: F. A. Kirkpatrick, 112 †
Descriptive Geographies from Original Sources. The British Empire: F. D. Herbertson, 362 †
Native Races of the British Empire. Northern India: W. Crooke, 665 §
Brock, R. W., Preliminary Report on the Rossland, B.C., Mining District, 584 †
Brodrick, T. N., on measurement of Glacier movements in New Zealand, 349
Brooks, A. H., Report on Progress of Investigations of Mineral Resources of Alaska in 1905..688 †
Brown, A. S. and G. G., Guide to South Africa for use of Tourists, etc., 106 †
Brown, H. I., Expedition to the Ruwe Gold Mines, 90
Brown, R. M., Geographical Changeableness, 478 †; Mississippi River as a Trade Route, 107 †; Protection of the Alluvial Basin of the Mississippi, 474 †
Brown, R. N. R. (*see also* Mossman, R. C.), Antarctic Botany: its Present and Future Problems, 586 †
Browne, J. P., Lado Enclave and its commercial possibilities, 583 †
Bruce, C. D., Journey across Asia from Leh to Peking, 597 *; remarks on "Nine Years' Survey and Exploration in China," 305

Bruce, W. S., Report on Work of Scottish National Antarctic Expedition, 361 †
Brückner, Herr, on Stereoscopic Colouring of Maps, 680
Brühl, L., Die zweite Studienfahrt des Instituts für Meereskunde zu Berlin, 476 †
Bruhns, W., and H. Bücking, Die nutzbaren Mineralien und Gebirgsarten im Deutschen Reiche, 469 †
Brunhes, J., L'allure réelle des eaux et des vents enregistrée par les sables, 588 †; Sur une explication nouvelle du surcreusement glaciaire, 110 †; Sur les contradictions de l'érosion glaciaire, 110 †; and P. Girardin, Groupes d'habitations du Val d'Anniviers comme types d'établissements humains, 470 †
Bruyne, C. de, Contribution à l'étude phytogéographique de la zone maritime belge, 580 †
Bruzzo, G., Sopra alcune carte nautiche esistenti nella Biblioteca comunale di Bologna, 692 †
Buchet, G., Mission Buchet. Rapport sommaire d'ensemble, 473 †
Bücking, H.: *see* Bruhns, W.
Buckley, R. B., Irrigation Works of India, 358 †; remarks on "Irrigation in the United States," 426
Budge, E. A. W., Cook's Handbook for Egypt and the Sudan, 104 †
Buffault, P., Marche envahissante des dunes de Gascogne avant leur fixation, 580 †; Plateau d'Aubrac, 83 §, 356 †
Bujongolo, Ruwenzori, 134
Bujuku river, Ruwenzori, 140
Bulgaria—
  Bulgarien. Auf Grund eigener Reisen: C. Kassner, 355 †
Bülow, W. v., Vulkanische Tätigkeit auf Savaii, 109 †
Bunbury, Sir C. J. F., Life of: H. Lyell, 111 †
Bundar Abbas port, Persian gulf, 214
Burchell, W. J., Work and life of, E. B. Poulton on, 578
Burdon, J. A., Photograph of tablet erected in Sokoto in memory of H. Clapperton, 368 †
Burma—
  Mud Volcanoes off Coast of, 434
  Photographs of Upper Burma: G. Sowman, 120 †
  Wirtschafts-Geographie von Ober-Burma und den nördlichen Shan-Staaten: H. J. Wehrli, 687 †
Burnes, A., Geographical Work in Cutch and the Ran, 524
Burrard, S. G., Account of the scientific work of the Survey of India, 582 †; Auxiliary Tables to facilitate Calculations of Survey of India, 691 †
Bushire port, South-Eastern Persia, 214
Busse, W., Westafrikanische Nutzpflanzen, 120 †
Butagu river, Ruwenzori, 141
Butende tribe, East Africa, 254
Byers, C. A., on formation of Salton Lake, 461

C.

Cadière, L., Hautes Vallées du Sông-Gianh, 358 †
Cadoux, H. W., Photographs of Asiatic Turkey and Persia, 119 †
Cagni peak, Ruwenzori, height of, 140
Cairacross, W. M., A região de Manica, 473 †
Calabar river, Southern Nigeria, 58
California—
  Concerning the Great Californian Disaster: J. M. Dixon, 107 †
  Earthquake, The Californian, 106 †
  Earthquake Rift of 1906: D. S. Jordan, 584 †
  Great fault of California and the San Francisco earthquake, April, 1906: E. P. Carey, 689 †
  Klamath irrigation project, 410
  Making Geography while you wait: T. H. Macbride, 107 †
  Maps: Saltonsee, Californien, 1906: H. Erdmann, 481 †
Cambier, L., Mission technique au Congo français. Le chemin de fer projeté, 688 †; Survey for railways in French Congo, 347
Campbell, M., Natural Mounds, 691 †; Rock Folds due to Weathering, 691 †
Camsell, C., Surveys in Yukon and Mackenzie Districts, 348
Canada—
  Ekwan River, etc., Report of an Exploration of: D. B. Dowling, 584 †
  Expedition to the Northern Archipelago under J. E. Bernier, 93
  Expedition of the Dominion Government to Hudson Bay and the Arctic Islands: A. P. Low, 359 †
  Galicians dwelling in Canada and their Origin: M. A. Sherbinin, 359 †
  Geological Survey Dept., Summary Report for 1905..584 †
  Handbook for travellers. Dominion of Canada, with Newfoundland: K. Baedeker, 474 †
  Maps:
    Geological Survey of Canada: Province of Nova Scotia (Geol. Survey), 592 †
    Manitoba, Saskatchewan and Alberta (Dept. of Interior, Ottawa), 116 †, 698 †
    Sectional Map of Canada (Dept. of Interior, Ottawa), 115 †, 245 †, 365 †
    Standard Topographical Map of Canada (Dept. of Interior, Ottawa), 245 †
    Topographic Map of Canada (Dept. of Militia and Defence), 481 †, 592 †
  Neptune, Cruise of the: A. P. Low, 449 §

Canada—*continued.*
Surveys in Yukon and Mackenzie Districts by C. Camsell, 348
Canadian Rockies: *see* Rocky Mountains
Canals—
British Canals: is their resuscitation practicable? E. A. Pratt, 102 †, 219 §
Ocean and Inland Water Transportation: E. R. Johnson, 219 §
Waterways, Our: U. A. Forbes and W. H. R. Ashford, 219 §
Canary Islands—
Kanarischen Inseln. Eine geographische Studie: K. Sapper, 583 †
Canning, A. W., Journey across Western Australia, 678
Cape Colony—
Climate of East London: J. R. Sutton, 358 †
Geological Commission, Annual Report, 68 §.
Maps: Geological Map of Colony of Cape of Good Hope (Cape Geological Commission), 591 †
Report of His Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty, 1905.. 583 †
Carey, E. P., The great fault of California, and the San Francisco earthquake, 689 †
Carinthia—
Glaziale Studien im Vellachtale: F. Heritsch, 685 †
Carolina, North—
Where the Wind does the Work: C. Cobb, 107 †
Caroline Islands—
Yap Island, Note on, 231
Cartography—
Ideals for, 4
Monument der Kartography des XV. und des XVI. Jahrhunderts im Ungarischen Nationalmuseum zu Budapest: P. Teleki, 692 †
Nachricht über die soeben entdeckte Ähnlichkeit des Globus von Rouen und der Karte Gastaldis? P. Graf Teleki, 111 †
Topographical Section of the General Staff: G. R. Frith, 691 †
Caspian Sea—
Russian Hydrographical Surveys, 632, 645
Castor, example of Inclosure of Common Fields, 35
Catalogue—
English Catalogue of Books, 241 †
Catatonk Folio, Drumlinoids of the: G. D. Hubbard, 107 †
Cator, D., Surveys in Northern Nigeria, 345
Caucasus—
Maps: Karte des kaukasischen Hochgebirges: M. von Déchy, 114 †; Map of Caucasia (Top. Section, General Staff), 695 †
Cauvin, —, and — Cortier, Expedition to Taodeni, 347
Caves—
Höhlenkunde, mit Berücksichtigung der Karstphänomene; W. von Knebel, 451 §
Cavo, Monte, Alcune osservazioni geologiche sul: P. Moderni, 101 †
Cecchini, C., Distribuzione delle ferrovie in Italia, 101 †
Cevennes—
Day in the Cévennes: W. M. Davis, 99 †
Ceylon—
Administration Reports, 1905. Survey Report: P. D. Warren, 314 §, 582 †
Colonial Reports, Ceylon. Report on Results of Mineral Survey, 1904-5: W. R. Dunstan, 686 †
Chad, Lake—
Hydrography of Region of, Lieut. Freydenberg on, 569
Wasserweg von Meerbusen von Guinea zum Tschadsee (Faure), 688 †
Chaix, E., Utilité d'un Atlas international d'érosion, 587 †
Chakalik town, Turkestan, 611
Chalikiopoulos, L., Anpassungsbedingungen und Entwickelungsmotive der Kultur, 361 †
Chamberlin, T. C., On a possible reversal of deep-sea circulation and its influence on geologic climates, 476 †
Chambezi river, Rhodesia, 372, 376
Chams—
Notes sur les Chams: E. M. Durand, 358 †
Chanel, C., Origines de San Francisco et la découverte de l'or, 107 †
Chang La, Central Asia, 600
Chang-thang, Tibet, 539, 545
Channel Islands—
Archipel Anglo-Normand. La question der Ecrehous: P. A. du Boulley, 356 †
Maps: Bartholomew's reduced Survey Maps of Channel Islands, 694 †
Ch'ao Hu (lake), China, 283
Chapman, R. H., Deserts of Nevada and the Death Valley, 585 †
Charcot, J. B., Le "Français au Pôle Sud," 361 †, 450 §; New Expedition to the Antarctic, 464
Charente Inférieure—
Fabrication du sel marin dans les marais Salants de la Charente-Inférieure, Notice sur la, 356 †
Charts—
Admiralty, † 117, 247, 366, 483, 593, 699
Chilian Hydrographic Charts, 595 †
Meteorological Charts of Indian Ocean and Red Sea (Met. Office, London), † 118, 248, 368, 483, 595, 699
Meteorological Charts of North Atlantic and Mediterranean (Met. Office, London), † 118, 248, 368, 483, 595, 700
Norway: Specialkarte over den norske kyst (Norges Geo. Opmaaling), 483 †
Pilot Charts of North Atlantic Ocean

Charts—*continued.*
(U.S. Hydrog. Office), † 248, 368, 483, 595
Pilot Charts of North Pacific Ocean (U.S. Hydrog. Office), † 118, 248, 368, 483, 595, 700
Chautard, J., Étude Géophysique et Géologique sur le Fouta-Djallon, 104 †
Cheeseman, T. F., Manual of New Zealand Flora, 109 †
Ch'eng-yang-kuan, China, 282
Cherchen, Chinese Turkestan, 610
Cheredei river, Mashonaland, 15
Chevalier, A., Le cacao. Sa production et sa consommation dans le monde, 477 †
Chiapas—
Geologie von Chiapas und Tabasco: K. Sapper, 584 †
Chibougaman Mining Region, Quebec, Report on: A. P. Low, 90
Chiem Lake—
Seeschwankungen (seiches) des Chiemsees: A. Endrös, 580 †
Chih-li—
Maps: Province of Chih-li (southern sheet) (Top. Section, General Staff), 364 †
Inner, 182, 188
Outer, 182; Commercial prospects, 296: G. B. McAndrew and [A. R. Y.] Kirkpatrick's Journey in, 189
Chile—
Erdbeben in Mittel-Chile vom 16. Aug. 1906, Vorläufige Mitteilungen über das: H. Steffen, 585 †
Maps: Comision Chilena de Limites (Oficina de Limites, Santiago), 116 †, 365 †, 698 †; Hydrographic Charts (Oficina Hidrografica), 595 †
Terremoti nel Chili, Sulla distribuzione topografica dei: M. Baratta, 462 §, 689 †
Chili, Rio—
Estudio para aumentar las aguas del Rio Chili: H. C. Hurd, 239 †
China—
Army of, 299
Bibliotheca Sinica. Dictionnaire Bibliographique des ouvrages relatifs à l'Empire Chinois: H. Cordier, 582 †
Commercial prospects, 295
Great Wall of, 200, 273
Loess formation of Northern China, 606, 619, 623
Names of Places in China, List of, Conventional spelling in War Office publications, 357 †
Nine Years' Survey and Exploration in Northern and Central China: A. W. S. Wingate, 174 *, 273 *
Peking-Hankow Railway, 686 †
People of, character, 297
Photographs: H. G. Ponting, 595 †
Railways, Geography of, 288
Trade and Trade Reports, 1905, Returns of, Imperial Maritime Customs, 582 †
China—*continued.*
Western: Captain D'Ollone's Expedition, 225; Count de Marsay's journey, 344
China Sea Directory, 686 †
Chirengwa pool, Rhodesia, 379
Cholnoky, E. v., Verteilung des Niederschlags als Ursache eines wichtigen geophysischen Vorganges, 110 †
Chongolo's, Rhodesia, 374
Chota Nagpore—
Sammlung von Sagen, Märchen und Liedern der Oraon in Chota Nágpur: F. Hahn, 582 †
Chu-Kar, Tibet, 208
Chu-Naku, Tibet, 208
Chung-t'ai, Temples on summit of, 275, 276
Church, G. E., remarks on "Irrigation in the United States," 428
Churnon-Chu river, north-eastern Tibet, 224
Civil Service Examinations and Geography, 73
Clancey, J. C., Survey Manual for Land Records Officers, 691 †
Clapperton Memorial, Photograph of: J. A. Burdon, 368 †
Clark, G. A., on the Bogoslov islands, Bering Sea, 228
Clarke, H. B., Modern Spain, 1815–1898.. 101 †
Clayden, A. W., History of Devonshire scenery, 470 †
Climates—
Changes of Climate: R. De C. Ward, 691 †
Classification of Climates: R. de C. Ward, 587 †
Deep-sea circulation and its influence on geologic climates, On a possible reversal of: T. C. Chamberlin, 476 †
Oscillations of solar activity and the climate: C. Easton, 691 †
Present day climates in their time relation: F. M. Ball, 691 †
Studien über das Klima der geologischen Vergangenheit: F. Freck, 587 †
Close, C. F., on Work of the Research Department of R.G.S., 233; remarks on: "From the Victoria Nyanza to Kilimanjaro," 271; "The Most Reliable values of Heights of Central African Lakes and Mountains," 323; "Nine Years' Survey and Exploration in China," 305
Clouds—
Height of Clouds measured by Reflectors, J. Rheden's observations, 233
Clozel, F.-J., Dix ans à la Côte d'Ivoire, 473 †, 557 §
Coastal Zone, Limits of, R. Hunger on, 232
Coats Land ice-barrier, Antarctic, 80
Cobb, C., Notes on Geology of Currituck Banks, 238 †; Where the Wind does the Work, 107 †

Cochinchina: *see* Indo-China, French
Cockayne, L., Notes on a brief botanical visit to the Poor Knights Islands, 92 §, 475 †; Notes on the Subalpine Scrub of Mount Fyffe (Seaward Kaikouras), 92 §, 475 †
Cocoa—
Cacao. Sa production et sa consommation dans le monde: A. Chevalier, 477 †
Coetivy island, Seychelles, 149
Coffee—
São Paulo, Brazil, Coffee Production in, letter from F. H. Sawyer on, 353
Collen, Sir E., remarks on "Nine Years' Survey and Exploration in Northern and Central China," 303
Collins, M. R., Irrigation in the Transvaal, 688 †
Colombia—
Republic of Colombia: F. L. Petre, 217 §
Urbevölkerung (Indios bravos) in der Kolumbischen West-Kordillere, Reste der: F. Regel, 108 †
Colombo—
Maps: Colombo in 1904–5 (Surveyor-General, Ceylon), 244 †
Colonies—
Historical Geography of the British Colonies: C. P. Lucas, 478 †
Colorado river—
Grand Cañon of the Colorado, The making of the: A. R. Crook, 689 †
Irrigation projects, 409, 416, 428
Overflow of Colorado into the Salton depression, 461
Colquhoun, A. R., remarks on "Irrigation in the United States," 427
Columbus—
Christopher Columbus and the New World of his discovery: F. Young, 477 †
Ruge, Sophus, et ses vues sur Colomb: H. Vignaud, 111 †
Commerce—
Weltwirtschaft: eine Jahr- und Lesebuch: E. von Halle, 692 †
Common Fields, Inclosure of, Considered geographically: G. Slater, 35 *
Communications—
Fusspfad und Wege geographisch betrachtet: G. Dressler, 111 †
Comoro Islands, Scientific Exploration of, by A. Voeltzkow, 458
Confourier, E., Description géographique du Maroc d'Az-Zyâny, 105 †
Congo—
Congo au Lac Tchad: J. Decorse, 104 †
Forest of the, P. H. G. Powell-Cotton's Expedition, 346
Nebenflüsse des Kongo als Verkehrsstrassen: D. Kürchhoff, 583 †
Travaux Géographiques Tchèques. I. Le Congo: V. Svambera, 583 †
Congo, French—
Mission technique au Congo français. Le chemin de fer projeté: L. Cambier, 688 †
Railway Survey by L. Cambier, 347
Surveys for delimitation of Frontier between Kamerun and French Congo, 676
Congo State—
Annales du Musée du Congo. Ethnographie et Anthropologie, 472 †
Dislocations du bassin du Congo. I. Le Graben de l'Upemba: J. Cornet, 583 †
Elila, Ricognizione nel Bacino dell': E. Cordella, 359 †
Ethnographie Congolaise; Les riverains de l'Uelé: — Védy, 583 †
Katanga, Distribution des sources thermales au: J. Cornet, 583 †
Katanga Mines, Reports on, Tanganyika Concessions, Ltd., 90 §, 583 †
Lado Enclave and its commercial possibilities: J. P. Browne, 583 †
Maniema, Appunti sulla zona del: E. Cordella, 472 †
Red Rubber; Story of the Rubber Slave-trade: E. D. Morel, 104 †
Connecticut—
Maps: Preliminary geological map of Connecticut: H. E. Gregory and H. H. Robinson, 698 †
Constance, Lake—
Seenkunde und Völkerrecht: W. Halbfass, 236 †
Constantinople—
Travels to and from Constantinople, 1827–28: C. Frankland, 112 †
Conti, N. de, Poggio Bracciolini und, in ihrer Bedeutung für die Geographie des Renaissancezeitalters: W. Sens, burg, 589 †
Conway, Sir M., Spitsbergen, 661 *
Cook, Mount, First traverse of: M. Ross, 586 †
Coolidge, W. A. B., Colonies Vallaisannes de l'Oberland Bernois, 581 †; on Charles the Great's Passage across the Alps, 455
Cordella, E., Appunti sulla zona del Maniema, 472 †; Ricognizione nel Bacino dell' Elila (Stats indipendente del Congo), 359 †
Cordier, H., Bibliotheca Sinica. Dictionnaire Bibliographique des ouvrages relatifs à l'Empire Chinois, 582 †; Cinq lettres inédites du Père Gerbillon, Missionaire français à Pe-king, 687 †; Le Périple d'Afrique, 359 †
Cori, C. J., Ein österreichisches Forschungsschiff, 685 †
Cornet, J., Dislocations du bassin du Congo. I. Le Graben de l'Upemba, 583 †; Sur la distribution des Sources thermales au Katanga, 583 †
Cornish, V., Notes on Japanese Temples and Monasteries, 358 †; Progressive Waves in Rivers, 23 *

Costa Rica—
Boundary between Costa Rica and Panama, Agreement of 1907..572
Traversant la République de Costa-Rica: M. Saillard, 689 †
Cotton—
Cotton Production and Statistics of Cottonseed Products (Dept. of Commerce and Labor), 474 †
Cowan, J., Maori Place-names, 586 †
Cox, B., remarks on "The Seychelles Archipelago," 169
Cox, W. G., Irrigation with Surface and Subterranean Waters and Land Drainage, etc., 111 †
Creak, E., remarks on "To the North Magnetic Pole and through the North-West Passage," 516
Créqui-Montfort, Comte G. de, Fouilles de la mission scientifique française à Tiahuanaco, 239 †
Crook, A. R., The making of the Grand Cañon of the Colorado, 689 †
Crooke, W., Native Races of the British Empire, North India, 665 §
Cross river, Southern Nigeria, 60
Crowther, F., Notes on a District of the Gold Coast, 473 †
Cuba—
Cuba, the Pearl of the Antilles, 689 †
Culture—
Ampassungsbedingungen und Entwickelungsmotive der Kultur: L. Chalikiopoulos, 361 †
Evolution of Culture, and other Essays: A. L. Pitt-Rivers, 111 †
Cumberland Gap coalfield, Kentucky, Geology and Mineral resources of: G. H. Ashley and L. C. Glenn, 107 †
Cunnington, W. A., Zoological Results of Third Tanganyika Expedition. Various Reports, 583 †
Currelly, C. T.: *see* Petrie, W. M. F.
Currents—
Courants marins—Le Gulf-Stream: A. Berget, 240 †
Theorie der Meeresströmungen: C. Forch, 240 †
Currituck Banks, Geology of: C. Cobb, 238 †
Curzon range, Tibet, 602
Cutch and the Ran: R. Sivewright, 518 *
Cvijić, J., Remarques sur l'ethnographie de la Macédonie, 581 †; Sketch of Geography and Geology of Macedonia and Ancient Servia, etc., 469 †
Cyprus, Flora of: H. S. Thompson, 581 †

D.

Daae, A. and H., Indlands-og Kystbefolkningens Legemshøide, etc., 236 †
Dacca—
Romance of an Eastern Capital: F. B. Bradley-Birt, 454 §
D'Adhémar, — (*see* Audoin, —), 571
Dahomé—
Boundary between Nigeria and Dahomé, Treaty of 1907..569
Dainelli, G., and O. Marinelli, Delle condizioni altimetriche e dei limiti della grande depressione Dancala, 583 †; Dell' Erta-alè, vulcano ritenuto attivo della Dancalia settentrionale, 583 †
Dakkar, Tibet, 209
Daly, R. A., Abyssal Igneous Injection as a Causal Condition and as an effect of Mountain-building, 588 †
Dan, W., Geographische Verbreitung der Berufsgruppe des Deutschen Reiches; Chemische Industrie in 1895..685 †
Daneš, I. V., Beitrag zur Kenntnis des Karstphänomens, 455 §, 685 †; Geomorphologische Studien in den Tertiärbecken Südböhmens, 685 †
Dann, E. W., Orography and History, 478 †
Danube—
Donau von Passau bis Linz: R. Trampler, 580 †
Dar Homr, Some Notes on: W. Lloyd, 649 *
Darton, N. H., Geology of the Bighorn Mountains, 689 †
David, M., L'Albanie et la Chaîne du Pinde, 581 †
Davidson, —, remarks on "The Seychelles Archipelago," 173
Davidson, A. A., on characteristics of Murchison and Davenport ranges in Central Australia, 229
Davidson, G., on the Bogoslov islands, Bering sea, 228 †; Points of Interest involved in the San Francisco Earthquake, 689 †; San Francisco Earthquake of April, 1906..689 †
Davis, W. M., A Day in the Cévennes, 99 †; Incised Meandering Valleys, 110 †
Deasy, Captain, remarks on "A Journey across Asia from Leh to Peking," 625
Death Valley, The Deserts of Nevada and the: R. H. Chapman, 585 †
Debal, Ancient town of, Sind, 531
Déchy, M. von, Karte des kaukasischen Hochgebirges, 114 †
Decorse, J., Du Congo au Lac Tchad, 104 †
Decoud, H. F., Geografía de la República del Paraguay, 474 †
Decoud, J. S., Crecientes del Rio Paraguay, 108 †
Deecke, W., Der Strelasund und Rügen, 343 §, 580 †
Deeken, R., Ein neuer Vulkan im Stillen Ozean, 109 †
Deglio, Lago—
Ricerche su un laghetto alpino: F. Bianchi, 101 †
Dehérain, H., Prise de possession de Sainte-Hélène par la Grande-Bretagne au XVII^e^ Siècle, 473 †
Delachaux, E. A. S., Problemas geográficos del Territorio Argentino, 585 †

Demontès, V., La mission du Commandant Huder à Tunis (1831), 688 †
De Moya, N., Mapa de la Isla de Santo Domingo y Haiti, 365 †
Denmark—
Danish Biological Station, Report of, to Board of Agriculture: C. G. J. Petersen, 355 †
Dennett, R. E., At the back of the Black Man's mind, 106 †
Derby, O. A., Serra do Espinhaço, Brazil, 360 †
Descombes, P., Études d'economie pastorale dans le Pyrénées, 685 †; Propriété communale dans les Pyrénés, etc., 237 †
Desert and the Sown: G. L. Bell, 445 §, 472 †
Deserts—
Faktoren der Wüstenbildung: H. Wiszwianski, 361 †
Desplagnes, —, Plateau Central du Soudan Nigérien, 584 †
Detlefsen, D., Ursprung, Einrichtung und Bedeutung der Erdkarte Agrippas, 592 †
Devon—
History of Devonshire Scenery: A. W. Clayden, 470 †
Dickins, V., Journey in South-Eastern Mashonaland, 15 *
Diels, L., Pflanzenwelt von West-Australien Südlich des Wendekreises, 239 †
Dinse, P., Neue Museum für Meereskunde in Berlin, 476 †
Diplomatic Negotiations of the United States with Russia, Early: J. C. Hildt, 241 †
Discovery, S.S., Logs of the, National Antarctic Expedition, 361 †
Disease—
Mission d'Études de la Maladie du Sommeil: MM. Bouvier, Giard, et Laveran, 589 †
Dixon, J. M., Concerning the Great Californian Disaster, 107 †
Dominica—
Notes upon the Island of Dominica: S. Grieve, 360 †
Domoko Oasis, Central Asia, excavations at, 35
Douxami, H., Le désert de Platé et les montagnes entre l'Arve et le Giffre (Haute-Savoie), 685 †
Dove, K., Britische Weltreich, 112 †
Doveton, A. J., Visit to Wei-ch'ang, 183
Dowling, D. B., Report of an Exploration of Ekwan River, etc., 584 †
Downing, A. M. W., Total Solar Eclipse of 1908..109 †
Drake—
Sir Francis Drake revived, 112 †
Dressler, G., Fusspfad und Wege geographisch betrachtet, 111 †
Drury, R., Les aventures de pendant ses quinze année's de captivité à Madagascar, etc.: A. et G. Grandidier, 105 †
Dubois, E., Geographical and geological signification of Hondsrug, etc., 685 †
Du Boulley, P. A., L'Archipel Anglo-Normand. La question des Ecrehous, 356 †
Dueñas, E. I., Recursos minerales de las provincias de Jauja y Huancayo, 474 †
Dufau, T., Voyage au pays du cacao et du sucre de canne, 690 †
Duffart, C., État actuel de la question des transformations anciennes et modernes du littoral gascon, de la formation récente et du comblement des lacs landais, 580 †
Dumortier, —, Excursion dans la Jura, 356 †
Duncan, J. E., A Summer Ride through Western Tibet, 75 §
Dunedin, Geology of: P. Marshall, 361 †
Dunstan, W., Colonial Reports. Ceylon. Report on Results of Mineral Survey in 1904–5..686 †; remarks on the "Seychelles Archipelago," 171
Durand, E. M., Notes sur les Chams, 358 †
Dustfalls—
Staubfälle, besonders im Passatgebiet des Nordatlantik: W. Krebs, 476 †
Dutch visits to Spitsbergen, 661
Du Toit, A. L., Underground Water in South-Eastern Bechuanaland, 358 †
Dutton, C. E., Volcanoes and Radioactivity, 241 †, 477 †
Duwoni peak, Ruwenzori, 130
Dyé, A. H., Report on Hydrographical Survey of West Coast of Morocco, 226

E.

Earth—
Constitution of the Interior of the Earth, as revealed by Earthquakes: R. D. Oldham, 361 †
Grösse der Erde: F. R. Helmert, 587 †
Grundgesetze der Erdreliefs: T. Arldt, 588 †
Isostatische Lagerung der äusseren Erdschichten: E. Hammer, 361 †
Land and Water, Irregularity of Distribution of, W. H. Pickering on, 576
Verteilung der Bevölkerung auf der Erde: A. Woeikow (map), 247 †
Vormen der Aardkorst: J. van Baren, 588 †
Earthquakes (*see also* Seismology)—
Connection between widely distant earthquakes, H. V. Gill on, 353
Fortpflanzung der Erdbebenwellen im Erdinnern, Ueber die Art der: H. Benndorf, 476 †
Grundzüge der geometrischen Theorie der Erdbeben: A. Pécsi, 476 †
Our greatest earthquakes: M. L. Fuller, 474 †
Problem of: J. S. Gardner, 240 †
East—
From West to East: Sir H. Jerningham, 454 §, 478 †

East and West Indian Mirror, being an account of Joris van Speilbergen's voyage round the World (1614–1617), etc.: J. A. J. de Villiers, 361 †
East Indies, Dutch—
Encyclopædie van Nederlandsch-Indie: P. A. van der Lith and others, 357 †
Studienreise nach Niederländisch-Indien, Bericht über eine: F. Heger, 686 †
Easter Island—
Trip to: V. S. Frank, 586 †
Eastern Seas, A Cruise through: A. O. Plate, 455 §
Eastman, C. R., Disputed Vesuvian Eruptions, 469 †
Easton, C., Oscillations of the Solar Activity and the Climate, 691 †
Eclipse—
Total Solar Eclipse of 1908: A. M. W. Downing, 109 †
Ecuador—
Hoch-Anden von Ecuador, In den: H. Meyer, 108 †, 538 §
Edinburgh—
Oceanographical Laboratory at, 234
Edward VII., King, remarks on "Snows of the Nile," 146
Egbira district, Northern Nigeria, 346
Egei river, Central Africa, 571
Egerer, E., Entwicklung der Städtischen Personenverkehrsmittel, 241 †
Egypt—
Cook's Handbook for Egypt and Sudan: E. A. W. Budge, 104 †
Maps—
Map of Egypt (Survey Dept.), 361 †
Provisional Map of Portion of Eastern Desert of Egypt (Survey Dept.), 115 †, 697 †
Topographical Map of Egypt (Survey Dept.), 480 †, 697 †
Tourist's Map of Egypt and Lower Nile (Bartholomew), 244 †
Survey Dept. in 1905, Report on work of: H. G. Lyons, 687 †
Surveys in India and in Egypt, Report, 441
Turco-Egyptian Frontier defined in 1906..88
Eifel und Venn. Eine pflanzengeographische Skizze: M. Koernicke and F. Roth, 368 †
Ekman, V. W., On Dead Water, 240 †; On Stationary Waves in Running Water, 588 †
Elena peak, Ruwenzori, height of, 139
Eliot, Sir C., Native Races of British East Africa Protectorate, 358 †
Eliot, Sir J., Climatological Atlas of India, 336 §
Elkington, E. W., Adrift in New Zealand, 108 †
Ellis-Barker, J., Absorption of Holland by Germany, 101 †
Emin mount, Ruwenzori, 140
Emmons, S. F., and E. C. Eckel, Contributions to Economic Geology, 689 †
Endrös, A., Seeschwankungen (Seiches) des Chiemsees, 580 †; Seichesbeobachtungen an den grösseren Seen des Salzkammergutes, 685 †
Engekley river, Mashonaland, 15
Engere Dabash river, East Africa, 255
England—
Geological Structure of English Lakeland upon its Present Features, Influence of the: J. E. Marr, 582 †
Maps: Canals, etc., in Midland Counties of England: G. Bradshaw, 113 †
England and Wales—
Maps: Geological Surveys, 114 †, 242 †, 363 †, 480 †, 694 †; Ordnance Surveys, 113 †, 242 †, 363 †, 479 †, 590 †, 694 †
Run-rig system of land cultivation, 46
Entebbe, Uganda, 127
Erdmann, H., Saltonsee California, Oktober 1906 (map), 481 †
Eritrea—
Climatologia eritrea, Appunti di: A. M. Tancredi, 675 §, 688 †
Condizioni altimetriche e dei limiti della grande depressione Dancala: G. Dainelli ed O. Marinelli, 583 †
Erta-alè, vulcano ritenuto attivo della Dancalia Settentrionale: G. Dainelli e O. Marinelli, 583 †
Herbstausflug nach Eritrea: K. Hassert, 584 †
Maps: Schizzo dimostrativo delle vie di comunicazione fra l'Eritrea il Sudan e l'Etiopia: C. Rossetti, 115 †
Erok mountain, East Africa, 260
Erosion—
Atlas international d'érosion, Utilité d'un: E. Chaix, 587 †
Eskimo of Arctic America, 495, 502
Euganean Hills—
Idrografia dei colli Euganei: L. de Marchi, 101 †
Eurasia—
Desiccation of, L. Berg on, 350
Europe—
Cruise across Europe: D. Maxwell, 356 †, 444 §
Deutsch-spanische Ortsnamen: J. Jungser, 237 †
Europe (moins la France), au début du xx^e^ siècle: M. Fallex et A. Mairey, 356 †
Kinglake's Eothen: D. G. Hogarth, 99 †
Maps:—
Hypsometrischen Uebersichtskarte von Mittel-Europa (K. u. K. Militärgeographisches Institut), 590 †
Liebenow-Ravenstein's Special-Radfahrerkarte von Mittel-Europe, 362 †
Neue Uebersichts-Karte von Mittel-Europa (K. u. K. Militärgeographisches Institut), 362 †
Mitteleuropa und Nordeuropa: K. Weule, 356 †

Europe—*continued.*
Moustérien dans l'Europe Occidentale, Note sur le: A. de Paniagua, 470 †
Storms of February, 1907, Report, 672
Eustache, G., Dans le région des "Puys," 99 †
Evans, J. W., remarks on "A new Island in the Bay of Bengal," 536
Everdingen, E. van, Oberflächentemperaturbeobachtungen in der Nordsee, 589 †
Everest, Mount, height of, 443
Ewing, W., Arab and Druze at home, 454 §, 472 †
Exner, F. M., Ueber Druck und Temperatur bewegter Luft, 476 †
Exploration—
Romance of Early Exploration: A. Williams, 477 †
World's Exploration Story: A. Lee, 111 †

F.

Færöe Islands—
Algenvegetationsbilder von der Küsten der Färöer: F. Borgesen, 248 †
Photographs of: D. Hepburn, 368 †
Falckner's Curieuse Nachricht von Pennsylvania: J. F. Sachse, 238 †
Falkland Islands—
Phyllotheca-Reste aus den Falkland-Inseln: A. G. Nathorst, 360 †
Vegetationsbilder .. von den Falkland-Inseln: C. Skottsberg, 120 †
Fallex, M., et A. Mairey, L'Europe (moins la France) au début du XX^e^ siècle, 356 †
Farabee, W. C., Expedition into Interior of South America, 229
Farges, L., L'Aude et l'Ariège, 356 †
Faria, P. G., Futuros ferrocarriles de Marruecos, 473 †
Farquhar island, Indian ocean, 149
Faure, —, Wasserweg von Meerbusen von Guinea zum Tschadsee, 688 †
Faustini, A., Di una carte nautica inedita della Georgia Australe, 587 †
Fawcett, P. H., Survey of frontier between Bolivia and Brazil, 574
Fehr, I., Linnés Svenska resor, 693 †
Feilhauer, G., Ueber die Oberflächenformen und die geologischen Verhältnisse des Westsudan, 584 †
Feray, M., Japonais à Haï-Nan sous la dynastie des Ming, 357 †
Fergusson, S. P., Meteorological Phenomena on Mountain Summits, 110 †
Ferrar, H. T., Antarctic Ice-cap, 690 †
Fester, G., Tagebuchblätter aus Island, 101 †
Ficker, H. von, Beiträge zur Dynamik des Föhns, 110 †; On cold air-masses across the Alps, 84
Field, A. M., Admiralty Surveys during 1906..663; remarks on: "A New Island in the Bay of Bengal," 536; "To the North Magnetic Pole and through the North-West Passage," 517
Fiji Volcanic Zone, On the: N. Fukuchi, 471 †
Filchner, W., Rätsel des Matschu. Meine Tibet-Expedition, 102 †
Finland—
Maps: Karta öfver Storfurstendömet Finland: M. Wijkberg and W. Arppe, 242 †
Seefischerei Finnlands. Uebersicht ueber die: J. A. Sandman, 470 †
Finsterwalder, S.: *see* Blümcke, A., 110 †
Fischer, E. S., Isthmus von Panama, 360 †
Fischer, T., Küstenstudien und Reiseeindrücke aus Algerien, 583 †
Fishberg, M., The Jews: a Study of Race and Environment, 478 †
Fisher, E. F., Terraces of the West River, Vermont, 689 †
Fishes—
Ostseefische, Laichen und Wandern der: S. Strodtmann, 477 †
Flanders—
Flandre, La, Étude géographique de la Plaine Flamande en France, Belgique et Hollande: R. Blanchard, 102 †
Float, Remarkable voyage of a, 95
Fonteneau, J. (biography): A. Pawlowski, 589 †
Forbes, U. A., and W. H. R. Ashford, Our Waterways, 219 §
Forch, C., Zur Theorie der Meeresströmungen, 240 †
Formosa—
Sketch of Eastern Taiwan: J. Öshima, 471 †
Fort Portal, Uganda, 131
Foster, W., English Factories in India, 1618–1621..471 †
Fraas, E.: *see* Branco, W.
France—
Abaissement du niveau de la nappe aquifère en Beauce et dans le département de l'Yonne: C. Rabot, 100 †
Âge des derniers volcans de la France: M. Boule, 100 †
Aubrac plateau, Geography of, 83
Carte de France, Considérations sur la: — Raymond, 99 †; Carte de France au 50,000^e^, La Nouvelle, 356 †
Maps: Carte de France (Ministre de l'Intérieur), 114 †, 243 †, 694 †; Carte de France (Service Géo. de l'Armée), 242 †
Nord et l'Est de la France et les Voies d'Accès au Simplon: A. Nérot, 100 †
"Puys," Dans le région des: G. Eustache, 99 †
Recensement général de la population, Résultats statistiques du, 356 †
Sol de la France, Esquisse tectonique du: E. Jourdy, 580 †
Transformations du littoral français: A. Pawlowski, 580 †
Treaty of 1907 between France and Siam, 569
Wolf in France, Disappearance of, 343

Frank, V. S., A Trip to Easter Island, 586 †
Frankland, C., Travels to and from Constantinople, 1827–28..112 †
Frech, F., Studien über das Klima der geologischen Vergangenheit, 587 †
French Colonies—
Statistiques Coloniales pour les années de 1900 à 1904, 1905, Industrie Minière, 693 †
Frenzel, C. A., Major James Rennell, der Schöpfer der neueren Englischen Geographie, 478 †
Freshfield, D. W., Conquest of Ruwenzori; a Note, 326; remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 320, 322; Towards Ruwenzori, 238 †
Freydenberg, —, on Hydrography of Lake Chad Region, 569
Friesland—
Geest Ostfrieslands: R. Bielefeld, 685 †
Frigate island, Seychelles, 151
Frith, G. R., Topographical Section of the General Staff, 691 †
Fritzsche, R., Niederschlag, Abfluss und Verdunstung auf den Landflächen der Erde, 588 †
Frobenius, L., Forschungsreise in das Kassai-Gebiet, 472 †
Froidevaux, H., Mission hydrographique française au Maroc, 105 †
Früh, J., Ueber Naturbrücken und verwandte Formen, 691 †; Zur Morphologie des unteren Thurgau, 581 †
Fuchs, F. G., Región Cuprífera de los Alrededores de Ica y Nazca, 475 †
Fukuchi, N., On the Fiji Volcanic Zone, 471 †
Fülleborn, F., Deutsche Njassa- und Ruwuma-Gebiet, Land und Leute, 472 †
Fuller, M. L., Our greatest earthquakes, 474 †
Fyffe, Mount, Subalpine Scrub of: L. Cockayne, 92 §, 475 †

G.

Gallieni, —, Neuf ans à Madagascar, 584 †
Gallois, L., Material Equipment for teaching Geography in the French Schools, 112 †
Gambia—
Maps: Gambia, reproduced from work of Anglo-French Boundary Commission, 1904–05 (Top. Section, General Staff), 480 †
Gannett, H., Certain Relations of Rainfall and Temperature to Tree-growth, 587 †
Garde, V., State of the Ice in the Arctic Seas, 1905..109 †
Gardiner, J. S., Problem of Earthquakes, 240 †; Seychelles Archipelago, 148 *
Garriott, E. B., Cold Waves and Frost in the United States, 585 †
Gascony—
Lège, le Porge, et les fables du littoral gascon: — Saint-Jours, 356 †
Marche envahissante des dunes de Gascogne avant leur fixation: P. Buffault, 580 †
Gastaldi—
Carte d'America di Giacomo Gastaldi: S. Grande, 670 §
Gazetteer—
Ritters geographisches-statistisches lexikon über die Erdteile, etc.: J. Pengler, 241 †
Geelmuyden, H., Den magnetiske Misvisning i Norge, 237 †
Geikie, J., Late Quaternary Formations of Scotland, 238 †
Geinitz, F. E., Die Eiszeit, 110 †, 452 §; Einwirkung der Silvestersturmflut 1904 auf die mecklenburgische Küste, 356 †
General Staff, Topographical Section of the: G. R. Frith, 691 †
Gentil, L., Dans le Bled es Siba. Explorations au Maroc, 447 §
Geodesy—
Anteil der Vereinigten Staaten an der Erforschung der Erdgestalt durch Gradmessungen: B. Pattenhausen, 691 †
Ausgleichung der Widersprüche in den Winkelbedingungsgleichungen trigonometrischer Netze: L. Krüger, 109 †
Courbures du geoïde dans le tunnel du Simplon: M. Brillouin, 587 †
French Geodetic Expedition to measure the Quito Arc, Notes on work of the, 211
Geographical and Astronomical Grammar: — Salmon, 113 †
Geographical Changeableness: R. M. Brown, 478 †
Geographical Congress—
"Geographentag," 578; Proceedings of, 681
Sixth Italian, 578
Geographical Education—
Importance of, 10–12
Geographical Ideals: Sir G. T. Goldie, 1 *, 693 †
Geographical Literature of the Month—
Africa, 104, 238, 358, 472, 583, 687
America, 106, 238, 359, 474, 584, 688
Anthropogeography and Historical Geography, 111, 361, 477, 589, 692
Asia, 102, 357, 471, 582, 686
Australasia and Pacific Islands, 108, 239, 360, 475, 586, 690
Biography, 111, 478, 589, 693
Europe, 99, 236, 355, 469, 580, 685
General, 112, 241, 362, 478, 589, 693
Mathematical geography, 109, 241, 587, 691
Physical and Biological Geography, 109, 239, 361, 475, 587, 691
Polar Regions, 109, 361, 586, 690

Geography—
Ältere Zonenlehre der Griechen: H. Berger, 478 †
Annales de Géographie. XV^e Bibliographie Géographique Annuelle, 1905..589 †
Atlas de Géographie Historique: F. Schrader, 593 †
Atlas de Géographie moderne: F. Schrader, F. Prudent, et E. Anthoine, 593 †
Dawn of Modern Geography, vol. 3, History of Exploration, etc.: C. R. Beazley, 81 §, 111 †
Elementary Studies in Geography: H. J. Mackinder, 560 §
Fundamental and the Incidental in Geography: R. H. Whitbeck, 112 †
Geography and Life: W. J. Sutherland, 361 †
Making Geography while you wait: T. H. Macbride, 107 †
Material Equipment for teaching Geography in French Schools: L. Gallois, 112 †
Nieuwere opvattingen van Aardrijkskunde: C. M. Kan, 693 †
Oxford Geographies: A. J. Herbertson, 560 §
Physiography and Geography: G. D. Hubbard, 112 †
Practical Teaching of Geography in Schools and Colleges: A. Morgan, 478 †
Preliminary Geography: A. J. Herbertson, 112 †
Progressive Course of Comparative Geography: P. H. L'Estrange, 560 §
Public Schools, Geography in our: R. E. Macnaghten, 112 †, 241 †
Public Service, Geography and the, 73
Regional Geography, A field for studies in: W. S. Tower, 589 †
Social Geography, Study of: G. W. Hoke, 64 *
War and Peace, Ideals for Geography in, 8
War, Geography in relation to: E. S. May, 478 †
Geology—
Folding of Subjacent Strata by Glacial Action: F. W. Sardeson, 109 †
Geological Reports from South Africa, Recent, 68
Rock Folds due to Weathering: M. R. Campbell, 691 †
Sundry Geological Problems: G. Henriksen, 587 †
Geophysics—
Substratum archéen du globe et le mécanisme de actions: géodynamiques: E. Jourdy, 691 †
George, F. R., South Australia. Report on Prospecting Expedition north of Nullabor Plains, 475 †
George, P., Heutige Mexiko und seine Kulturfortschritte, 78 §
George river, Labrador, 349
Gerbillon, Père, Cinq lettres inédites du: H. Cordier, 687 †
German Colonies—
Deutsche Kolonialreich. Eine politisch-geographische Studie: B. F. Hänsch, 693 †
Maps: Grosser Deutschen Kolonialatlas: P. Sprigade und M. Moisel, 245 †; Wirtschafts-Atlas der deutschen Kolonien (Kolonial-Wirtschaftliche Komitee), 482 †
German Geographentag, 578, 681
German Hydrographical Surveys in the Western Pacific, 679
Germany—
Deutschlands mittlere Jahres . . . Temperaturen: L. Neumann, 100 †
Geographische Verbreitung der Berufsgruppe des Deutschen Reiches: Chemische Industrie in 1895: W. Dan, 685 †
Grossstadtferne Deutschlands in den Jahren 1871 und 1905: R. Tronnier, 685 †
Human settlement in Germany, and distribution of steppe plants: R. Gradmann, 85
Journal of a Tour in Germany: J. T. James, 113 †
Maps: Ältesten gedrückten Karten der sächsisch thüringischen Länder: V. Hantzsch, 363 †; Karte des Deutschen Reiches (K. Preussische Landesaufnahme), 114 †, 243 †, 363 †, 480 †, 590 †, 694 †; Pflanzengeographischen Einteilung und Umgrenzung Norddeutschlands, 480 †
Mineralien und Gebirgsarten im Deutschen Reiche, Die nutzbaren: W. Bruhns, 469 †
Slav and Low German Place-names, Herren Kühnel and Mucke on, 672
Volkszählung im Deutschen Reiche, 1905, Vorläufige Ergebnisse der, 100 †
Weltwirtschaft; ein Jahr- und Lesebuch: E. von Halle, 100 †
Gessi, Mount, Ruwenzori, 140
Geysers—
Source of Waters of Geysers: J. M. Maclaren, 352 §, 588 †
Ghalla, Wadi el, 650
Giard, —: *see* Bouvier, —
Gibson, W., and C. B. Wedd, Geology of Country around Stoke-upon-Trent, 686 †
Gilbert, G. K. (Biography of), Israel C. Russell, 1852–1906..693 †; Investigation of the San Francisco Earthquake, 584 †
Gilbert islands, Pacific, 668
Gill, H. V., on Connection between widely distant Earthquakes, 353
Gill, Sir D., remarks on "North-Eastern Rhodesia," 396; and others, Report on Boundary Survey between British Bechuanaland and German South-West Africa, 106 †

Gill, T., Who discovered Lake Alexandrina? 690 †
Gillman, G., Valley of Almanzora, with portions of Provinces of Jaen, Granada, etc. (Maps), 695 †
Gioia—
Primo documento intorno a un Di Gioia amalfitano: F. Porena, 589 †
Girardin, P. (*see also* Brunhes, J.), Glacier des Evettes en Maurienne (Savoie), 100 †
Giza—
Map: Topographical Map of Giza Province (Survey Department, Cairo), 697 †
Gjöa, Voyage of the, 488
Gjöahavn, King William Land, 494
Glacial Epoch—
Eiszeit, Die: F. E. Geinitz, 110 †, 452 §
Glaciation—
Vergletscherung der Erde von Pol zu Pol: M. Gugenhan, 110 †
Glaciers—
Débacles glaciaires: C. Rabot, 588 †
Erosion glaciaire, Contradictions de l': J. Brunhes, 110 †
Glacial Erosion in Alaska, R. S. Tarr's study of, 572
Gletscherbewegung mit Berücksichtigung ihres senkrechten Anteiles: A. Blümcke und S. Finsterwalder, 110 †
Surcreusement glaciaire, Sur une explication nouvelle du: J. Brunhes, 110 †
Variations of: H. F. Reid, 475 †
Variations périodiques des glaciers: H. F. Reid et M. Muret, 692 †
Viscous versus the Granular Theory of Glacial Motion: O. W. Willcox, 559 §, 692 †
Gleadowe-Newcomen, A. H., Report on British Indian Commercial Mission to South-Eastern Persia, 212
Glenn, L. C.: *see* Ashley, G. H.
Globe—
Globus von Gemma Frisius: W. Ruge, 589 †
Gloucester—
Gloucester in National History: F. A. Hyett, 102 †
Gold Coast—
Maps: Map of the Gold Coast: F. G. Guggisberg, 697 †; Northern Territories (Top. Section, General Staff), 591 †; Provisional Map of the Gold Coast (Top. Section, General Staff), 697 †
Notes on a District of the Gold Coast: F. Crowther, 473 †
Goldie, Sir G. T.—
Geographical Ideals, 1 *, 693 †
Remarks at opening meeting of session 1906–07..96
Remarks on: "A Journey across Asia from Leh to Peking," 623, 626; "From the Victoria Nyanza to Kilimanjaro," 269, 272; "Irrigation in the United States," 423; "Most Reliable Values of Heights of Central African Lakes and Mountains," 320; "Nine Years' Survey and Exploration in Northern and Central China," 302; "North-Eastern Rhodesia," 395; "Seychelles Archipelago," 168; "Snows of the Nile," 146; "To the North Magnetic Pole and through the North-West Passage," 513
Goldthwait, J. W., Correlation of the raised beaches on west side of Lake Michigan, 474 †
Goode, R. A. J., remarks on "North-Eastern Rhodesia," 399
Goode, J. P., Laboratory Work with the Sun, 478 †
Goodrich-Freer, A., In a Syrian Saddle, 103 †
Gottschling, E., The Bawenda; a Sketch of their History and Customs," 238 †
Götz, A., Brandenburgish-preussische Kolonisation in Guinea unter Friedrich Wilhelm, 688 †
Gough island, South Atlantic, 81
Govi, S., Appunti su alcune salse e fontane ardenti della provincia di Modena, 581 †; Il Lago Scaffaiolo, 101 †
Gradmann, R., on Human Settlement in Germany and distribution of steppe plants, 85
Graebner, F.: *see* Stephan, E.
Graff, K., Spiegelungs- und Refraktionserscheinungen an der See, 110 †
Graham's Land—
Geology of Graham Land: J. G. Andersson, 586 †, 668 †
Granada—
Memories, Adventures, Studies, and Impressions: L. Williams, 101 †
Grande, S., Carte d'America di Giacomo Gastaldi, 670 §
Grandidier, A. et G., Collection des Ouvrages anciens concernant Madagascar. Les aventures de Robert Drury, 105 †
Gravity—
Periodische Verschiebungen des Schwerpunktes der Erde: R. Spitaler, 475 †
Greece—
Ionische Wanderung, Ueber die: — von Wilamowitz-Moellendorff, 101 †
Greenland—
East: W. Thalbitzer's expedition, 232
North-East Coast: Duke of Orleans' expedition, 93
Greenly, E., River Cefni in Anglesey, 238 †
Gregory, H. E., and H. H. Robinson, Preliminary Geological Map of Connecticut, 698 †
Gregory, J. W., remarks on "Irrigation in the United States," 426
Greim, G., Niederschlagshöhe . . . im Grossherzogtum Hessen im Jahre

1904..100 †; Studien aus dem Paznaun. II. Der Jamtalferner bis 1897..355 †
Grieve, S., Notes upon the Island of Dominica, 360 †
Griffin, P. C.: *see* Stiles, H. R.
Grund, A., on the "poljes" of the Karst, 455
Grünnbach conduit, roll waves in the, 25–27
Gugenhan, M., Vergletscherung der Erde von Pol zu Pol, 110 †; Der Stuttgarter Talkessel—von alpinem Eis ausgehöhlt! 469 †
Guggisberg, F. G., Map of the Gold Coast, 697 †
Gu Gut plain, Tibet, 602
Guiana, British—
Impressions of a Naturalist in: A. Heilprin, 689 †
Guinea—
Brandenburgish-preussische Kolonisation in Guinea unter Friedrich Wilhelm: A. Götz, 688 †
Gulf Stream—
Circulation of water at fountain head of the Gulf Stream, J. C. Soley on, 677
Gunten conduit, roll waves in the, 27
Günther, S., Varenius, 218 §
Guppy, H. B., Observations of a Naturalist in the Pacific. Plant-dispersal, 340 §
Gurdon, P. R. T., The Khasis, 665 §
Gurla Mandhata, Himalaya, 204, 206
Guyou, E., Application du téléphone . . . à la détermination de la longitude de Brest, 99 †
Guyon, —, Commerce de la Côte Occidentale de Madagascar avec la Côte Est d'Afrique, 105 †
Gwynn, C. W., Grant awarded to, 567
Gyanema, Tibet, 208

H.

Habenicht, H., und C. Böhmer, Karte von Alaska, 364 †
Haddon, A. C., Krämer's "Hawaii Ostmikronesien und Samoa," 668 §
Hahn, F., Sammlung von Sagen, Märchen und Liedern der Oraon in Chota Nágpur, 582 †
Hainan—
Japonais à Haï-Nan sous la dynastie des Ming: M. Feray, 357 †
Haiti—
Climatology of Haiti in the Eighteenth Century: C. F. Talman, 108 †
Maps: Mapa de la Isla de Santo Domingo y Haiti: N. de Moya, 365 †
Hakluyt—
Hakluytus Posthumus or Purchas His Pilgrimes: S. Purchas, 241 †, 362 †
Hakrá, lost river of Sind, 523, 531
Halbert, J. N., Zoological Results of the Third Tanganyika Expedition. Report on the *Hydrachnida*, 359 †
Halbfass, W., Seenkunde und Völkerrecht, 236 †
Hale, R., Journal of a Voyage to Nova Scotia made in 1731..584 †
Hall, P. F., Immigration and its effects upon the United States, 107 †
Hall, R. N., letter from, on the Zimbabwe Temple and Discovery of Nanking China, 682
Halle, D. E. von, Die Weltwirtschaft; ein Jahre- und Lesebuch, 100 †, 692 †
Hamberg, A., Astronomische . . . Arbeiten der von A. G. Nathorst geleiteten schwedischen Polarexpedition 1898.. 361 †, 587 †; Hydrographische Arbeiten der von A. G. Nathorst geleiteten schwedischen Polarexpedition 1898.. 690 †
Hamberg, H. E., Moyennes mensuelles et annuelles de la température . . . à l'Observatoire de Stockholm, 237 †
Hamilton, A., Afghanistan, 102 †
Hamilton, Sir V., remarks on "To the North Magnetic Pole and through the North-West Passage," 515
Hammer, E., Die isostatische Lagerung der äusseren Erdschichten, 361 †; Geographische Längen durch die drahtlose Telegraphie, 691 †
Hamy, E.-T., Une lettre inédite du voyageur J.-B. Tavernier (1664), 241 †
Handley, C., Briton, Boer, and Black, 473 †
Hanguya Tati, Central Asia, Excavations at, 33
Hänsch, B. F., Das deutsche Kolonialreich-Eine politisch-geographische Studie, 693 †
Hansen, A. M., on the steppe lands of ancient Germany and their settlement, 85
Hansen, J., Carte topographique du Grand Duché de Luxembourg, 590 †
Hantzsch, V., Die ältesten gedrückten Karten der sächsisch-thüringischen Lander, 363 †
Hardy, M., Végétation des Highlands d'Écosse, 686 †
Harmsworth Atlas and Gazetteer, 116 †, 246 †, 365 †, 482 †, 593 †, 698 †
Harris, R. A., Cotidal Lines for the World, 241 †; Early knowledge of the tides at Panama, 108 †
Harz—
Guide issued by Association for Promoting Travel to the Harz, 100 †
Siedelungskunde der Ostharzes, Beiträge zur: H. Wüstenhagen, 580 †
Hasse, E., Deutschen in Russland, 237 †
Hassel, J. M. von, Rios Alto Madre de Dios y Paucartambo, 585 †
Hassert, K., Herbstausflug nach Eritrea, 584 †
Hata, Town of, Northern China, 548
Hatch, F. H., Presidential Address, delivered to the Geological Society of South Africa, 238 †

Hattersley, C. W., Uganda by pen and camera, 359 †
Hauser, C., Cities in the Negeb, and Tribal Boundaries, 103 †
Haute-Savoie—
Désert de Platé et les montagnes entre l'Arve et le Giffre: H. Douxami, 685 †
Hawaii—
Hawaii, Ostmikronesien, und Samoa: A. Krämer, 361 †, 668 §
Hayden, E. E., Present Status of the use of Standard Time, 691 †
Haydon, A., remarks on "The Seychelles Archipelago," 173
Haystacks Mountain—
Tarns on the Haystacks Mountain, Cumberland: R. H. Rastall and B. Smith, 343 §, 686 †
Headlam, E. J., A new Island in the Bay of Bengal, 430 *
Heaton, E. W., A Scientific Geography. Book II. The British Isles, 357 †, 454 §
Heaton, H., remarks on "The Seychelles Archipelago," 170
Heawood, E., remarks on "Cutch and the Ran," 538
Hedin, S., Explorations in Tibet, 344, 456, 539
Hedley, J., Lao Ho in Inner Mongolia, 545 *; Photographs of Inner Mongolia or Outer Chih-li, 483 †
Heger, F., Bericht über eine Studienreise nach Niederländisch-Indien, 686 †
Hegyfoky, J., Schwankung der jährlichen Regenmenge in Ungarn, 580 †
Heilprin, A., Impressions of a Naturalist in British Guiana, 689 †; Rock of the Pelée Obelisk, and condition of volcano in February, 1906..585 †; Shattered Obelisk of Mont Pelée, 585 †
Hellmann, G., Ueber die Kenntnis der Magnetischen Deklination von Christoph Columbus, 241 †
Helmert, F. R., Grösse der Erde, 587 †
Helmolt, H. F., Weltgeschichte, 356 †
Heltling, —, Ascent of Aconcagua, 349
Henning, G., Reiseberichte über Sibirien von Herberstein bis Ides, 103 †
Henriksen, G., Sundry Geological Problems, 587 †
Hepburn, D., Photographs of the Færöe Islands, 368 †
Hérault—
Géographie Générale du Département de l'Hérault: Société Languedocienne de Géographie, 100 †
Herbertson, A. J., Oxford Geographies: Junior, 560 §; Preliminary, 112 †
Herbertson, F. D., Descriptive Geographies from Original Sources, The British Empire, 362 †
Hereros—
Herero, Die, Ein Beitrag zur Landes-Volks, und Missionskunde: I. Irle, 359 †
Heritsch, F., Glaziale Studien im Vellachtale, 685 †
Heron, R., Journey through the Western Highlands of Scotland, 112 †
Herrmann, J., Fahrt nach dem Ob und dem Jenissei im Jahre 1905..103 †
Herrmann, W., Exploration of middle course of the Pilcomayo river, 461
Herzfeld, E., Routenkarte von Bachdad nach Siraz durch Luristan, etc., 591 †, 696 †
Hessen—
Hessische Landes- und Volkskunde: C. Hessler, 356 †
Niederschlagshöhe . . . im Grossherzogtum Hessen im Jahre 1904: G. Greim, 100 †
Hessler, C., Hessische Landes- und Volkskunde, 356 †
Hildt, J. C., Early Diplomatic Negotiations of the United States with Russia, 241 †
Hill, Sir C., remarks on "From the Victoria Nyanza to Kilimanjaro," 270
Hillier, Sir W., remarks on "Nine Years' Survey and Exploration in China," 304
Hills, E. H., remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 320–323
Hilton-Simpson, M. W., Algiers and Beyond, 104 †, 447 §; Photographs of the Sahara, 596 †
Himalayas—
Geology of Outer Himalayas, G. Pilgrim's observations, 86
Journey through the Western Himalayas, Notes on a: T. G. Longstaff, 201 *
Täler des nordwestlichen Himalaya: K. Oestreich, 471 †
Hindlip, Lord, Sport and Travel: Abyssinia and British East Africa, 104 †, 556 §
Hinrichsen, —, Landverteilung auf den Halligen, 580 †
History—
Orography and History: E. W. Dunn, 478 †
Hoar-frost, Formation at High Altitudes, 95
Hobbs, W. H., Grand eruption of Vesuvius in 1906..581 †
Hocquet, A., Tournai et le Tournaisis au XVI^e siècle au point de vue politique et social, 685 †
Hoffer, M., Unterirdisch entwässererte Gebiete in den nördlichen Kalkalpen, 685 †
Hogarth, D. G., Kinglake's Eothen, 99 †
Hogben, G., Brief Notes on Theory of New Zealand Earthquakes, 586 †
Högbom, A. G., Norrland; Naturbeskrifning, 470 †
Hoke, G. W., Study of Social Geography, 64 *
Holdich, Sir T. H., remarks on: "Cutch and the Ran," 535; "Journey across Asia from Leh to Peking," 623; "The

Most Reliable Value of Heights of Central African Lakes and Mountains," 322; Review of Crookes' 'Native Races of the British Empire, Northern India,' and Gurdon's 'The Khasis,' 665; Tibet the Mysterious, 74 §, 103 †
Holland—
Absorption of Holland by Germany: J. Ellis-Barker, 101 †
Geographical and Geological Signification of the Hondsrug, etc.: E. Dubois, 685 †
Pêche hollandaise dans la mer du Nord et dans le Zuiderzée, 469 †
Vloed van 12 Maart 1906 in Zeeland: A. A. Beekman, 101 †
Hollar, W., London, Westminster, and Southwark (Maps), 695 †
Homann, J. B., Atlas Novus Terrarum Orbis Imperia Regna et Status exactis tabulis geographicé demonstrans, 113 †
Homeric Knowledge of the High North: K. Blind, 111 †
Hommel, F., Grundriss der Geographie und Geschichte des alten Orients, 103 †
Homr Arabs, Country of the, 649
Ho-Nan—
Maps: Province of Ho-Nan (Top. Section, General Staff), 244 †
Hondsrug—
Geographical and geological signification of the Hondsrug, etc.: E. Dubois, 685 †
Geological structure and origin of the Hondsrug, Some observations on the: H. G. Jonker, 685 †
Hopfner, F., Ueber die Grösse der solaren Wärmemengen, 588 †; Verteilung der solaren Wärmestrahlung auf der Erde, 476 †
Hornaday, W. T., Camp Fires in the Canadian Rockies, 106 †
Horrocks, J. A., Journal of expedition in South Australia, 690 †
Hoshiapur District, Punjab, Gazetteer, 471 †
Hough, W., Pueblo Environment, 106 †
Hovey, E. O., Notes on Northern Mexico, 360 †
Hsi Ling, Imperial Tomb of Emperor of China, 197
Huai river, China, 282
Huang Ho or Yellow river, G. B. McAndrew's Journey down, 189
Hua-yeh-ling pass, China, 275
Hubbard, G. D., Drumlinoids of the Catatouk Folio, 107 †; Industrial and Commercial Importance of a Tropical Possession, 477 †; Physiography and Geography, 112 †
Hubbard, L., Journey across Labrador, 349; Labrador, from Lake Melville to Ungava Bay, 688 †
Huber, J., Arboreticum Amazonicum, 585 †
Huber, R., Empire Ottoman. Division Administrative (Map), 243 †
Huddersfield—
Ecology of Woodland Plants in Neighbourhood of: T. W. Woodhead, 686 †
Hudson bay—
Dominion Government Expedition to Hudson Bay and Arctic Islands on the *Neptune*, Report: A. P. Low, 359 †
Hui-chou, China, 286
Hulbert, A. B., The Ohio River, a Course of Empire, 107 †
Humphries, T., New Zealand. Report on the Department of Lands. Surveys, 1905–06 .. 586 †
Hungary—
Középkori Várak különös tekintettel Magyarországra: J. Könyöki, 101 †
Schwankung der jährlichen Regenmenge in Ungarn: J. Hegyfoky, 580 †
Wasserkräfte Ungarns: E. Viczián, 469 †
Hunger, R., Schwemmlandküste des Arno, 101 †, 232 §
Hunt, G.: *see* Boas, F.
Huntington, E., Journey to Lob Nor, 674; Pangong; a glacial lake in the Tibetan plateau, 456 §, 583 †
Hurd, H. C., Estudio para aumentar las aguas del Rio Chili, 239 †
Hurley, F. A., Irrigation in the Transvaal, 238 †
Hydrographical Survey in Russia, Account of: J. de Schokalsky, 626 *
Hydrology—
Science hydrologique; ses méthodes, etc.: R. d'Andrimont, 476 †
Hyett, F. A., Gloucester in National History, 102 †

I.

Ibanda, Uganda, 132
Ice—
Eiswirkung an Seeufern: G. Braun, 577 §, 588 †
Formation de la glace de fond: J. de Schokalsky, 588 †
Ground-ice, Report of Committee for Study of, 692 †
Ice Age—
Eiszeit, Die: F. E. Geinitz, 110 †, 452 §
Iceland—
Glaciers de l'Islande méridionale de 1893–1894 à 1903–1904, Variations des: C. Rabot, 581 †
Hydrography of Waters north of Iceland, Contributions to: J. N. Nielsen, 587 †
Island. Grundriss der Geographie und Geologie: T. Thoroddsen, 101 †
Periodische Schwankungen der Eisdrift bei Island: W. Meinardus, 589 †
Strandebene in Island, Ueber ein Stück einer: G. Braun, 101 †
Tagebuchblätter aus Island: G. Fester, 101 †

Idaho—
Payette-Boise Irrigation Project, 411
Inclosure of Common Fields considered geographically: G. Slater, 35 *
India—
Aux Indes et au Népal: K. Boeck, 358 †
Cartografia-antica dell' India: F. L. Pullé, 446 §
Central Provinces District Gazetteers: R. V. Russell, 471 †
Climatological Atlas of India: Sir J. Eliot, 336 §
Cutch and the Run: R. Sivewright, 518 *
English Factories in India, 1618-1621: W. Foster, 471 †
India: P. Loti. Translated by G. A. F. Inman, 216 §, 358 †
Industrial Organization of an Indian Province: T. Morison, 102 †, 454 §
Irrigation in, 425
Irrigation Works of India: R. B. Buckley, 358 †
Khasis, The: P. R. T. Gurdon, 665 §
Maps: Government Surveys, 695 †; Thacker's Reduced Survey Map of India: J. G. Bartholomew, 244 †
Marine Survey of India, 1905–06, Administration Report, 687 †
Mineral Production of India during 1905: T. D. La Touche, 687 †
Native Races of the British Empire. Northern India: W. Crooke, 665 §
Photographs: H. G. Ponting, 595 †
Romance of an Eastern Capital: F. B. Bradley-Birt, 102 †
Scientific Advice, Board of, Annual Report, 1904–05..358 †
Survey of India: Account of scientific work, etc.: S. G. Burrard, 582 †; Auxiliary Tables to facilitate calculations of the: S. G. Burrard, 691 †; Extracts from Narrative Reports of Officers for 1903-04..442 §, 582 †; General Report on the operations of, for 1904–05..687 †; Report for 1903–04, letter from F. S. Longe on, 234; Report for 1904–05..441 §
Tamil Grammar Self-taught: M. de Z. Wickremasinghe, 471 †
Tourist's India: E. Reynolds-Ball, 454 §, 687 †
Trees, An Account of, etc.: D. Brandis, 102 †
Under the Sun. Impressions of Indian Cities: P. Landon, 102 †
Indian Ocean—
Bodengestaltung des nordwestlichen Indischen Ozeans: R. Lütgens, 588 †
Maps: Meteorological Chart of Indian Ocean and Red Sea, 118 †, 248 †, 368 †, 483 †, 595 †, 699 †
Riffe und Inseln des westlichen Indischen Ozeans. VIII. Ceylon: A. Voeltzkow, 582 †
Indo-China—
French: Publications de la Société des Études Indo-Chinoises. Géographie physique . . . de la Cochinchine, 687 †
Mission Pavie Indo-Chine, 1879–95. Géographie et Voyages. II. Exposé des Travaux de la Mission: A. Pavie, 357 †
Indus, Changes in Course of, 535
Inman, G. A. F., Translation of Loti's "India," 216 †
Inouye, K., and T. Ogawa, Geology and Mineral Resource of Southern Shengking Province, 357 †
Ireland—
Maps: Surface Geology of Ireland: J. Bartholomew, 243 †
Irle, J., Die Herero. Ein Beitrag zur Landes-, Volks-, und Missionskunde, 359 †
Irrigation—
Irrigation with Surface and Subterranean Waters and Land Drainage, etc.: W. G. Cox, 111 †
United States, Irrigation in the: J. H. Beacom, 400 *
Isachsen, G., on Prince of Monaco's Expedition to Spitsbergen, 462
Isuria Escarpment, East Africa, 255
Italian Geographical Congress, Sixth, 578
Italy—
Carta del Territorio Trevigiano nell' Atlante Magini: G. L. Bertolini, 101 †
Collegamento del tempio di Serapide alla livellazione geometrica di precisione e nuove determinazioni altimetriche nella regione dei Campi Flegrei, 101 †
Descrittione di tutta Italia: L. Alberti, 112 †
Distribuzione delle ferrovie in Italia: C. Cecchini, 101 †
Laghi Lapisini, Contributo allo studio dei: G. P. Magrini, 581 †
Scaffaiolo, Il Lago: S. Govi, 101 †
Vulcano Laziale e specialmente sul Monte Cavo, Alcune osservazioni geologiche sul: P. Moderni, 101 †
Ivory in Commerce and in the Arts: A. Maskell, 692 †
Ivory Coast—
Dix ans à la Côte d'Ivoire: F.-J. Clozel, 473 †, 557 §
Iwashiro—
Yukunakinuma Lake, Iwashiro Province: A. and H. Tanaka, 471 †

J.

Jackel, O., Bilder von der letzten Eruption des Vesuvs, 581 †
Jackson, A. V. W., Persia Past and Present, 74 §, 103 †
Jacob, L., Chemins de fer Africains, 358 †
Jaeger, F., Der Meru, 88 §, 104 †; Journey

over the Masai Steppe, 226; Scientific researches on Kilimanjaro, 457; Vositzenden der Landeskundlichen Kommission über eine Reise nach dem Kibo, 688 †
Jaeger, J., Der Schliersee, 100 †
Jaggar, T. A., Eruption of Mount Vesuvius, April, 1906..236 †
Jamaica—
Earthquake at Kingston, January 14, 1907..229, 332
James, J. T., Journal of a Tour in Germany, 113 †
Jannasch, R., Argentinien als Wirtschafts- und Auswanderungsgebiet, 585 †; Spezialkarte von Santa Catharina Rio Grande do Sul, und Uruguay, 482 †
Janssen, M. F., Sur une expédition en ballon dirigeable, projetée pour l'Exploration du Pôle Nord, 109 †
Japan—
Dictionnaire d'histoire et de géographie du Japon: E. Papinot, 471 †
Fiji Volcanic Zone: N. Fukuchi, 471 †
Photographs of: H. G. Ponting, 595 †
Sulphur Island, Geographical Trip to the New: D. Sato, 471 †
Temples and Monasteries, Notes on: V. Cornish, 358 †
Yamanaka, Lake: A. Tanaka, 471 †
Yukunakinuma, Lake: A. Tanaka, 471 †
Java—
Deep-sea soundings off south coast of, 575
Regenval aan de Vlakke Kusten van Java: J. F. Niermeyer, 687 †
Jefferson, M.S. W., Material for Geography of Michigan, 689 †
Je-ho—
Natural column of conglomerate at, 180
Potala at, 180, 185
Jena—
Gelandeform des Jenaer Schlachtfeldes: E. Piltz, 100 †
Jenkins, H. D.: *see* Kettle, W. R.
Jerningham, Sir H., From East to West, 454 §, 478 †
Jews—
Study of Race and Environment: M. Fishberg, 478 †
Johnson, E. R., Ocean and Inland Water Transportation, 219 §
Johnston, W. & A. K., The M.P. Atlas, 246 †
Johnston peak, Ruwenzori, height of, 140
Jonker, H. G., Some observations on the geological structure and origin of the Hondsrug, 685 †
Jordan, D. S., Earthquake Rift of 1906.. 584 †; and G. A. Clark, Notes on the Bogoslov Islands, Bering Sea, 228
Jordan, E. O., Self-purification of Streams, 588 †
Jourdain, J., First visit to the Seychelles, 150
Jourdy, E., Esquisse tectonique du sol de la France, 580 †; Substratum archéen du globe et le mécanisme des actions géodynamiques, 691 †
Joutel's Journal of La Salle's Last Voyage, 1684–7: H. R. Stiles and P. C. Griffin, 107 †
Jukes-Browne, A. J., Clay-with-Flints: its Origin and Distribution, 470 †
Jungser, J., Deutsch-spanische Ortsnamen, 237 †
Jura—
Excursion dans le Jura: M. Dumortier, 356 †
Répartition et Mode de Groupement des populations dans le Jura Central et Méridional: G. Legaret, 236 †
Jurab river, Central Africa, 571

K.

Kaffa—
Reise nach Kaffa und Da'uro: A. Freiherrn von Mylius, 687 †
Kafuru straits, Lake Albert Edward, 328
Kaiser, M., Land- und Seewinde an der Deutschen Ostseeküste, 580 †
Kalahari—
Kalahari au pointe de vue de la géographie humaine: L. Zels, 688 †
Northern Kalahari Desert: W. Wilson, 474 †
Kamerun—
Bereisung des Mandara-Gebirges, Bericht über eine: — Zimmermann, 105 †
Boundary between Nigeria and the Kamerun, Agreement of 1906..458
Frontier between Kamerun and French Congo, Surveys for delimitation of, 676
Geological structure, 57
Grenzfestsetzung zwischen dem deutschen Gebiete Nordwest-Kamerun und dem britischen Gebiete Nigeria, 238 †
Grenzregulierung zwischen Kamerun und dem Congo-Français in den Jahren 1900 bis 1902, Berichte über die astronomischen und geodätischen Aufnahmen: L. Ambronn, 474 †
Maps: Entwickelung der Nordgrenze von Kamerun, 481 †
Mountain, Activity of Crater, 571
Kamolondo river, Survey by Lieut. Mauritz, 458
Kan, C. M., Nieuwere opvattingen van Aardrijkskunde, 693 †
Kangaroo island—
Frenchman's (Baudin's) Rock, Kangaroo Is.: C. E. O. Smyth, 690 †
Kansanshi Mine, North-West Rhodesia, Reports on, 90 §, 583 †
Kan-su, China, 618, 619
Kar-Koshun, Lob Nor region, 612–614, 674
Kara Nor, Changes in, 611

Karst—
Beitrag znr Kenntnis des Karstphänomens: I. V. Daneš, 455 §, 685 †
Karsten, G., and H. Schenck, Vegetationsbilder, 120 †, 248 †, 368 †, 700 †
Kassai—
Forschungsreise in das Kassai-Gebiet: L. Frobenius, 472 †
Kashmir—
Maps: Karte des westlichen Kaschmir, 244 †
Photographs of: E. MacI. Ritchie, 248 †
Kassner, C., Bulgarien. Auf Grund eigener Reisen, 355 †
Kastner, Prof., on Influence of Surface Waters on Ground Water, 679
Katanga—
Sources thermales au Katanga, Sur la distribution des: J. Cornet, 583 †
Tanganyika Concessions, Ltd., Engineers' and Managers' Reports on Gold, Tin, and Copper Mines of Katanga, etc., 90 §, 583 †
Keidel, H., Geologische Uebersicht über den Bau des zentralen Tian-Schan, 357 †
Kellogg, V. L., American Samoa, 475 †
Kenigha river, South Africa, 68
Kensington, W. C., New Zealand. Report on Department of Lands, State Forests, 1905–6..586 †
Kentucky—
Geology and Mineral Resources of Cumberland Gap coalfield: G. H. Ashley and L. C. Glenn, 107 †
Kenya—
Photograph of Mount Kenya, from near Ngani Nguki River: C. W. Neligan, 700 †
Kettle, W. R., and H. D. Jenkins, Pearson's Nautical Almanac and Tide Tables, 1907..587 †
Keyes, C. R., Physiography of New Mexico, 585 †
Khadalik Ruins, Central Asia, Manuscript finds at, 34
Khartum, Altitude of, 674
Khasis, The: P. R. T. Gurdon, 665 §
Khor Shalango, Kordofan, 650
Khotan oasis, cultivated area in the, 33
Kiaer, A. N., Norsk-amerikanske Befolknings geografiske Udbredelse i de Forenede Stater, 639 †
Kibo—
Vorsitzenden der Landeskundlichen Kommission über eine Reise nach dem Kibo: F. Jaeger, 226 §, 457 §, 688 †
Kiepert, R., Karte von Kleinasien, 114 †
Kilimanjaro—
From the Victoria Nyanza to Kilimanjaro: G. E. Smith, 249 *
Glacier investigations on, by F. Jaeger, 457
Heights and position, 318
Rainfall of, 659
King Edward peak, Ruwenzori, Height of, 140
Kinglake's Eothen: D. G. Hogarth, 99 †
Kingston, earthquake at, 229, 332
Kiniarok, Masai steppe, 226
Kirchhoff, A., Grenzstreitige Gebiet von Moresnet, 100 †; obituary, 465
Kiria, routes from, 607
Kirkpatrick [A. R. Y.], Journey in Outer Chih-li and down Yellow River, 189
Kirkpatrick, F. A., Lectures on British Colonization and Empire, 112 †
Kirunga volcano, activity of, 572
Kisii tribe, East Africa, 250
Kismayu, rainfall at, 656
Kisumu, Lake Victoria, 126
Kitchener peaks, Tibet, 602
Kivu, Lake, heights of, 318
Klamath Irrigation Project in Oregon and California, 410
Kleinschmidt, A., und H. Limbrock, Die Gesteine des Profils durch das südliche Musart-Tal im zentralen Tian-Schan, 357 †
Kleist, — v., England in Arabia, 472 †
Klössel, H., Deutsche Kolonisation in Südamerika, 475 †
Knebel, W. von, Höhlenkunde, mit Berücksichtigung der Karstphänomene, 451 §
Knox, A., Notes on the Geology of the Continent of Africa, 78 §
Koernicke, M., and F. Roth., Eifel und Venn. Eine pflanzengeographische Skizze, 368 †
Koert, Dr., Das Eisenerzlager von Banjeli in Togo, 238 †
Kohler, A., Der Philosoph Carl C. F. Krause als Geograph, 693 †
Kohlschütter, E., on barometer heights in East Africa, 315
Komoro islands—
Comoren, Die: A. Voeltzkow, 584 †
Könyöki, J., A Középkori Várak különös tekintettel Magyarországra, 101 †
Korea—
Corea e Coreani: C. Rossetti, 358 †
Kraepelin peak, Ruwenzori, height of, 140
Krämer, A., Hawaii, Ostmikronesien, und Samoa, 361 †, 668 †
Krämer, A., Hydrographical Work on the *Planet*, 94
Krause—
Philosoph Carl C. F. Krause als Geograph: A. Köhler, 693 †
Krebs, W., Staub-, Vogel- und Insekten-Transporte durch Luftströmungen, besonders aus der westlichen Sahara, 476 †; Staubfalle, besonders im Passatgebiet des Nordatlantik, 476 †; und K. Sapper, Ueber Beziehungen des Meeres zum Vulkanismus, 477 †
Kuen Lun—
Gold industry of, 606
Ridges of the, 602
Streams of the northern slopes, 609
Kühnel, Herr, and Herr Mucke, on Slav

and Low German Place-names in Germany, 672
Kukuru river, Rhodesia, 383
Kukuruku hills and district, South Nigeria, 57, 346
K'u-lu-kou, North China, 549
Kum tagh desert, 613–616
Kurchhoff, D.—
Alte und neue Handelsstrassen . . . in Nordost-Afrika, 105 †
Binnenwasserstrassen in Westafrica zwischen Senegal und Niger, 104 †
Lastenbeförderungsmittel in Africa, 687 †
Nebenflüsse des Kongo als Verkehrsstrassen, 583 †
Schiffahrt nach Afrika unter besonderer Berucksichtigung der deutschen Flagge, 358 †
Kurumtoli glacier, Himalaya, 210
Kusakabe, S., Frequency of After-shocks and Space-distribution of Seismic Waves, 692 †
Kwakiutl Texts: F. Boas and G. Hunt, 359 †
Kwang-chou-wan—
Territoire français de Kouangtchéou: P. Barré, 686 †

L.

Labrador—
Labrador, from Lake Melville to Ungava Bay: Mrs. L. Hubbard, 349 §, 688 †
Lure of the Labrador Wild: D. Wallace, 106 †
Lacroix, A., Avalanches sèches et les torrents boueux de l'éruption récente du Vésuve, 236 †; Conglomérats des explosions vulcaniennes du Vésuve, etc., 236 †; Sur l'éruption du Vésuve et en particulier sur les phénomènes explosifs, 236 †
Lacroix, N.: *see* Bernard, A.
Lado Enclave and its commercial possibilities: J. P. Browne, 583 †
Ladoga, Lake—
Russian Hydrographical Survey, 639
Lagos province, Lagoons of the, 64
Lake-shores—
Eiswirkung an Seeufern: G. Braun, 577 §, 588 †
Lakes—
Photographische Methode zur Bestimmung des Eindringens der Warmestrahlung in einer See: O. Frhr. v. u. z. Aufsess, 476 †
Plankton of some Irish Lakes, Comparative Study of the: W. and G. S. West, 238 †
Tarns on the Haystacks Mountain, B. H. Rastall and B. Smith, 343, 686 †
Lamplugh, G. W., remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 323
Lanak La, Central Asia, 600
Lancaster—
Maps: Canals situated in Counties of Lancaster, York, Derby, and Chester: G. Bradshaw, 113 †
Landes—
Transformations anciennes et modernes du littoral gascon, de la formation récente et du comblement des lacs landais: C. Duffart, 580 †
Landon, P., Under the Sun. Impressions of Indian Cities, 102 †, 454 §
Lane, A. C., Chemical evolution of the Ocean, 239 †
Lange, G., Map of River Pilcomayo, 482 †
Langer, J., Grenze der Bistümer Verden und Halberstadt von der Elbe bis zur Ohre, 580 †
Langhans, P., Justus Perthes' Wandkarte von Afrika zur Darstellung der Bodenbedeckung, 244 †
Lanrezac, —, Au pays Soudanais, 104 †
Lanzarote—
Beitrage zur Kenntnis von Palma und Lanzarote: K. Sapper, 358 †
Lao Ho, in Inner Mongolia: J. Hedley, 545 *
Laperrine, —, Expedition in Western Sahara, 346
Lapmark—
Naturvidenskabelige Station ved Vassijaure i Torne Lapmark: M. P. Porsild, 237 †
Larras, N., Population du Maroc, 105 †
La Salle's Last Voyage, 1684–7, Joutel's Journal of: H. R. Stiles and P. C. Griffin, 107 †
Latitude Calculator—
Notice sur l'Emploi du "Calculateur de latitude" proposé par A. de Wilkitsky en 1898..587 †
La Touche, T. D., Mineral Production of India during 1905..687 †
Laurie island, Antarctic, Meteorological station, 79, 80
Laveran, —: *see* Bouvier, —
Laziale Vulcano, Alcune osservazioni geologichi sul: P. Moderni, 101 †
Leardo Map of 1452..241 †
Leclercq, J., Le Maroc, 688 †; Spectacles d'outre-mer, 693 †
Lecoq, A. von, on Archæological Discoveries near Turfan, 224
Lee, A., World's Exploration Story, 111 †
Lee, I., The Coming of the British to Australia, 667 §
Legaret, G., Répartition et Mode de Groupement des populations dans le Jura Central et Méridional, 236 †
Legiener lakes—
Gruppe der Legiener Seen: G. Braun 580 †
Leh—
Journey across Asia from Leh to Peking: C. D. Bruce, 597 *
Lehmann, H., Zur Geschichte der Glasmalerei in der Schweiz, 470 †

Lekkoûa, Vallée du, Tribus arabes de la: E. Michaux-Bellaire et G. Salmon, 105 †
Lemaire, C., Tra Mez-Afriko, 472 † !
Leonard, A. G., Lower Niger and its Tribes, 105 †, 449 §
Léotard, J., Histoire de la Société (1786–1906), 478 †
Leroy, O. E.: *see* Adams, F. D.
L'Estrange, P. H., Progressive Atlas of Comparative Geography, 365 †; Progressive Course of Comparative Geography, 560 §
Lewis, F. J., Plant Remains in the Scottish Peat Mosses, 686 †
Liebenow-Ravenstein's Special-Radfahrerkarte von Mittel-Europe, 362 †
Lighten, Lake, Tibet, 540
Lillooet Indians: J. Teit, 359 †
Limbrock, H.: *see* Kleinschmidt, A.
Limnological station in Austria, 222
Limousin, Le: R. Paillot, 100 †
Linneus—
  Linnés Svenska resor: I. Fehr, 693 †
Lithgow, W., Totall Discourse of the Rare Adventures and Painefull Peregrinations . . . in Europe, Asia, and Affrica, 362 †
Lithography—
  Elements of Lithography and Sunprinting: W. H. Beverley, 587 †
Liu-kiu island, Deep troughs on oceanic side of, 679
Livingstone, D., Character and work of, referred to, 2
Livingstone College Year-book (1906), 241 †
Lloyd, W., Some Notes on Dar Homr, 649 *
Lob Nor, Journey to, E. Huntington's, 674
Lochmann, J. J., De la cartographie en Suisse, 581 †
Lockyer, Sir N., On the Observations of Stars made in some British Stone Circles, 238 †
Lockyer, W. J. S., Barometric Variations of Long Duration over Large Areas, 110 †
Logone river, Connection between the Benue and, 571
London—
  Maps—
    Country twenty-four miles round London, 1809: E. Mogg, 113 †
    Local Centres for University Extension Teaching from 1876–1905 (University Extension Guild), 695 †
    London, Westminster, and Southwark: W. Hollar, 695 †
    Metropolitan Railways, etc.: E. Stanford, 364 †
    Official railway map of London and its environs (Railway Clearing House), 363 †
Longe, F. S., letter from, on Report of the Survey of India for 1903–04..234
Longitudes—
  Geographische Längen durch die drahtlose Telegraphie: E. Hammer, 691 †
Longstaff, T. G., Mountain Sickness and its probable causes, 577 §, 693 †; Notes on a Journey through the Western Himalaya, 201 *
Lönnberg, E., Taxonomic and Biological Notes on Vertebrates, 690 †
Lorentz, H., Expedition in Southern New Guinea, 350
Lorenzo, G. de, Eruption of Vesuvius, April, 1906..469 †
Lorimer, N.: *see* Sladen, D.
Lorraine—
  Frontière Lorraine: Ardouin-Dumazet 580 †
Loti, P., India. Translated by G. A. F. Inman, 216 §, 358 †
Low, A. P., Cruise of the *Neptune*, 449 §; Notes and Suggestions on Arctic Travel, 587 †; Report on Chibougaman Mining Region, 90 §, 360 †; Report on Dominion Government Expedition to Hudson Bay and the Arctic Islands, 359 †
Löwentin Lake—
  Ice, Effects of, on Shores of Lake Löwentin, G. Braun's observations, 577
Luangwa river and valley, Rhodesia, 371, 382, 384, 393
Luapula river, Rhodesia, 372, 376
Lucas, C. P., Historical Geography of the British Colonies, 478 †
Lü-chou Fu, China, 282
Lugeon, M., et E. Argand, Sur la grande nappe de recouvrement de la Sicilie, 236 †
Luigi Di Savoia mount, Ruwenzori, 140
Lundi river, Mashonaland, 16
Lung-wang waterfall, Huang-ho, 194
Luray Caverns, 239 †
Lütgens, R., Zur Bodengestaltung des nordwestlichen Indischen Ozeans, 588 †
Luumbu river, Rhodesia, 393
Luxemburg—
  Maps: Carte topographique du Grand Duché de Luxembourg: J. Hansen, 590 †
Lyell, H., Life of Sir Chas. Bunbury, 111 †
Lyons, H. G., Rains of the Nile Basin in 1905..105 †, 340 §; Report on work of Survey Dept. (Egypt) in 1905..687 †

M.

McAndrew, G. B., and [A. R. Y.] Kirkpatrick's Journey in Outer Chih-li, 189
Macbride, T. H., Making Geography while you wait, 107 †
McClymont, J. R., First Expedition of the Portuguese to Banda, 687 †

Macdonald, Sir C., remarks on "Nine Years' Survey and Exploration in Northern and Central China," 302
Macedonia—
Ethnographie de la Macédonie, Remarques sur l' : J. Cvijić, 581 †
Geography and Geology of Macedonia and Ancient Servia : J. Cvijić, 469 †
Makedonische Fahrten : A. Struck, 470 †
Machado, C. R., Arterias de Communicação nos districtos de Sofala e Manica, 473 †
Machakos, Rainfall at, 656
Machinga range, Rhodesia, 370, 390
Machu—
Rätsel des Matschu. Meine Tibet-Expedition : W. Filchner, 102 †
Mackinder, H. J., Britain and the British Seas, 334 §, 470 † ; Elementary Studies in Geography, 560 § ; remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 322, 325 ; Stanford's New Orographical Map of North America, 592 †
Maclaren, J. M., Source of the Waters of Geysers, 352 §, 588 †
Maclaren, N., Photographs of Alaska and British Columbia, 700 †
McMurdo, J., Political Work in Cutch and the Ran, 524
Macnaghten, R. E., Geography in our Public Schools, 112 †, 241 †
McNair, J. F. A., Ophir, 478 †
Madagascar—
Collection des Ouvrages anciens concernant Madagascar. Les aventures de Robert Drury : A. et G. Grandidier, 105 †
Commerce de la Côte Occidentale de Madagascar avec la Côte Est d'Afrique : — Guyon, 105 †
Neuf ans à Madagascar : Gallieni, 584 †
Studien, Schilderungen und Erlebnisse : Graf zu Pappenheim, 359 †, 666 §
Tanala, Volk der, 105 †
Tananarive à la Mer, De, 105 †
Madan, A. C., Wisa Handbook : a short Introduction to the Wisa Dialect of North-Eastern Rhodesia, 359 †
Madras Presidency—
Photographs of Vijayanagar or Hampi : F. J. Varley, 120 †
Madre de Dios—
Rios Alto Madre de Dios y Paucartambo : J. M. von Hassel, 585 †
Magadi or soda lake, East Africa, 258
Magdeburg—
Geography and Economics in the Magdeburg Region, 568
Magnaghi, A., Le "Relazione Universali" di Giovanni Botero e le Origini della Statistica e dell' Antropogeografia, 589 †
Magnetism—
Magnetische Deklination vor Kolumbus erster Reise nach America tatsächlich unbekannt? A. Wolkenhauer, 588 †
Magrini, G. P., Contributo allo studio dei Laghi Lapisini, 581 †
Maguire, J. M., Campaigns of Napoleon, 693 †
Mahé island, Seychelles, 148
Mairey, A. : *see* Fallex, M.
Makalanga natives, Mashonaland, 22
Malagarasi river, Rhodesia, 370
Malaspina, A., e la relazione del suo viaggio (1789–1794) : A. Zeri, 589 †
Malaspina glacier, changes in, R. S. Tarr on, 460
Malay archipelago—
Maps : Sunda Gräben am Südrande des Malaischen Archipels : A. Supan, 591 †
Soundings by *Planet*, 576
Malay peninsula—
British Malaya : Sir F. Swettenham, 103 †, 335 §
Pagan Races of the Malay Peninsula : W. W. Skeat and C. O. Blagden, 102 †, 555 §
Photographs of : F. Adam, 595 †
Malcolm, N., remarks on "A Journey across Asia from Leh to Peking," 625
Maldive islands—
Note on Maldivian History : A. A. Perera, 471 †
Man—
Homme et la Terre : E. Reclus, 111 †
Ziele der Geographie des Menschen : O. Schlüter, 477 †
Mandvi, Cutch, 521
Mangin, L., Distribution des Algues : algues fixées, algues du Plankton, 476 †
Manica—
Arterias de Communicação nos districtos de Sofala e Manica : C. R. Machado, 473 †
Estatistica em paizes não civilisados. Territorio de Manica e Sofala, 473 †
Guia Postal do Territorio de Manica e Sofala, 473 †
History, Scenery and Great Game of Manica and Sofala : R. C. F. Maugham, 473 †
Região de Manica : W. M. Cairncross, 473 †
Maniema—
Appunti sulla zona del Maniema : E. Cordella, 472 †
Manitoba—
Maps : Manitoba, Saskatchewan and Alberta (Dept. of Interior, Ottawa), 116 †
Moose and Wapiti of Manitoba : J. P. Turner, 359 †
Manuscripts—
Manuscritos de los Comentarios al Apocalipsis de San Juan por San Beato de Liébana : A. Blázquez, 477 †
Maori Place-names : J. Cowan, 586 †
Maps—
Carte nautiche esistenti nella Biblioteca

Maps—*continued.*
comunale di Bologna: G. Bruzzo, 692 †
Contour maps, methods for, 7
Monument der Kartographie des xv. und des xvi. Jahrhunderts im Ungarischen Nationalmuseum zu Budapest: P. Teleki, 692 †
Stereoscopic Colouring of, Herr Brückner on, 680
Ursprung, Einrichtung und Bedeutung der Erdkarte Agrippas: D. Detlefsen, 692 †
Maps, New—
Africa, 115, 244, 364, 480, 591, 697
America, 115, 245, 364, 481, 592, 698
Asia, 114, 243, 364, 591, 695
Europe, 113, 242, 362, 479, 590, 694
General, 116, 245, 365, 482, 592, 698
Marañón, Ferrocarril de Paita al: E. C. Zegarra, 586 †
Marchi, L. de, L'idrografia dei colli Euganei, 101 †
Marek, R., Eduard Richters Leben und Wirken, 112 †
Margherita peak, Ruwenzori, height of, 139
Marianne islands, Deep troughs on oceanic side of, 679
Marinelli, O.: *see* Dainelli, G.
Marini, L., Mareografo d'alto Mare del Comandante Mensing, 240 †
Marmora sea, Russian Hydrographical Surveys, 636
Marr, J. E., Influence of the Geological Structure of English Lakeland upon its Present Features, 582 †
Marriott, W., Some facts about the Weather, 588 †
Marsay, Count de, Journey in Western China, 344
Marseilles—
Geographical Society: Histoire de la Société (1786–1906): J. Léotard, 478 †
Marshall, P., Geology of Dunedin, New Zealand, 361 †
Martel, E. A., Spéléogie au XX^e^ siècle, 240 †
Martin, D., Ancien cañon de la Blache et les vallées mortes du Gapençais, 580 †
Martin, P. F., Mexico's Treasure-house (Guanajuato), 106 †
Martinelli, F., Roma ricercata nel suo sito, 113 †
Martinez, B. T., Etnografia del Rio de la Plata, 239 †
Masai steppe, Journey over, made by F. Jaeger, 226
Masai tribe, East Africa, 256, 257
Masemik, La, Central Asia, 600
Mashonaland—
Journey in South-Eastern Mashonaland: V. Dickins, 15 *
Maskell, A., Ivory in Commerce and in the Arts, 692 †
Masudi, statements respecting volcanoes, 464
Maugham, R. C. F., Portuguese East Africa, 216 §, 473 †
Mauritz, —, Survey of Kamolondo river, 458
Maxwell, D., A Cruise across Europe, 356 †, 444 §
May, E. S., Geography in relation to War, 478 †
Mecklenburg—
Silvestersturmflut 1904 auf die mecklenburgische Küste, Die Einwirkung der: E. Geinitz, 356 †
Medals and awards of R.G.S., 566
Meetings of the R.G.S., Session 1906–1907..96–98, 235, 354, 468, 579, 683
Meiche, A., Herkunft der deutschen Siedler im Konigreich Sachsen nach den Ortsnamen und Mundarten, 100 †
Meinardus, W., Periodische Schwankungen der Eistrift bei Island, 589 †
Méndez, J., Carte des routes d'Espagne, 695 †
Mennel, F. P., Geological Survey of the Transvaal. Report for 1903..69 §; Geology of Southern Rhodesia, 72 §
Mercanton, P. L., Sur l'inclinaison magnétique terrestre aux époques préhistoriques, 241 †
Merligen conduit, Roll waves in, 25
Merrill, F. J., Evidences of Glaciation in Southern Arizona and Northern Sonora, 474 †
Mersey—
Tidal Régime of River Mersey: J. N. Shoolbred, 470 †
Meru, Der: F. Jaeger, 88 §, 104 †
Meteorology—
Meteorological Phenomena on Mountain Summits: S. P. Fergusson, 110 †
Niederschlag, Abfluss und Verdunstung auf den Landflächen der Erde: R. Fritzsche, 588 †
Mexico—
Earthquake of April 14, 1907..677
Einfluss des Menschen auf die Gestaltung des Mexikanish-mittelamerikanischen Landschaftsbildes: K. Sapper, 108 †
Heutige Mexiko und seine Kulturfortschritte: P. George, 78 §
Memoria Histórica, Técnica y Administrativa de las obras del desagüe del Valle de México, 1449–1900..584 †
Mexico's Treasure-house (Guanajuato): P. F. Martin, 106 †
Northern Mexico, Notes on: E. O. Hovey, 360 †
Mexico, Gulf of—
Currents in the Gulf of Mexico, J. C. Soley's investigations, 677
Meyer, H., In den Hoch-Anden von Ecuador, 108 †, 558 §
Mézières, A. B. de, Mission Bonnel de Mézières. Au Soudan Anglo-Égyptien, 472 †
Mfumbiro, Mount, Heights of, 309, 318
M'Gigie river, Mashonaland, 15

Michaux-Bellaire, E., et G. Salmon, Tribus arabes de la vallée du Lekkoûs, 105 †
Michell, Sir L., remarks on "North-Eastern Rhodesia," 397
Michieli, A., Galleria del Sempione e i nuovi transiti internazionali, 355 †
Michigan, Geography of, Material for: M. S. W. Jefferson, 689 †
Michigan Lake—
Raised beaches on west side of Lake Michigan, Correlation of the: J. W. Goldthwait, 474 †
Micronesia—
Ostmikronesien, Hawaii, und Samoa: A. Krämer, 361 †
Migrations of Peoples in the Ogowé Basin, Lieut. Avelot on, 460 §, 688 †
Mikkelsen, M., Explorations on Arctic Coast of America, 463
Milk River Irrigation Project, 414
Mill, H. R.—
Rainfall of East Riding of Yorkshire and Suffolk, 222 §, 686 †
Remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 323
South Africa as seen by a Meteorologist during Visit of British Association in 1905..106 †
Mirage—
Frage der Luftspiegelungen: O. Aulagen, 110 †
Spiegelungs- und Refraktionserscheinungen an der See: K. Graff, 110 †
Mircea, C. R., Distribuțiunea geografică a petroleului în țara noastră, 237 †
Mississippi—
Alluvial Basin of the Mississipi, Protection of the: R. M. Brown, 474 †
Discovery and Exploration of the Mississippi Valley: J. G. Shea, 107 †
Early Voyages up and down the Mississippi: J. G. Shea, 107 †
Trade Route, Mississippi river as a: R. M. Brown, 107 †
Mitchell, —, Five MS. vols. describing Journeys to Rome and Naples, 1817.. 113 †
Mobuku river and valley, 131, 133
Modena—
Appunti su alcune salse e fontane ardenti della provincia di Modena: S. Govi, 581 †
Moderni, P., Alcune osservazioni geologiche sul Vulcano Laziale e specialmente sul Monte Cavo, 101 †
Mogdishu—
Tre note sulla città di Mogadiscio: C. Rossetti, 688 †
Moebius peak, Ruwenzori, height of, 139
Mogg, E., New map of country 24 miles round London (1809), 113 †
Mohn, A., Une page d'Histoire de la Civilization! La Suède de la Révolution Norwégienne, 237 †
Mohuro peninsula, Victoria Nyanza, 252
Moidrey, J. de, Notes on the climate of Shanghai, 1873–1902..686 †
Moïs—
Deux ans chez les Moïs: — Baudesson, 358 †
Moisel, M. (*see also* Sprigade, P.), Karte des südlichen Teiles der Nguru-Berge, 245 †
Mombasa, rainfall at, 656
Monaco, Prince of, Expedition to Spitzbergen, 462
Moncrieff, A. R. H., World of To-Day, 112 †, 671 §
Mongolia—
Inner Mongolia or Outer Chih-li Province, 179
Lao Ho in Inner Mongolia: J. Hedley, 545 *
Photographs of Inner Mongolia or Outer Chih-li: J. Hedley, 483 †
Montana—
Yellowstone River Irrigation Projects, 410
Monti, V., Sulla misura della velocità di propogazione delle perturbazioni sismiche in rapporto alla sismometria razionale, 240 †
Montreal—
Artesian and other wells on the Island of Montreal: F. D. Adams and O. E. Leroy, 584 †
Montserrat—
Agricultural Industries of Montserrat, Report: F. Watts, 108 †
Moore peak, Ruwenzori, height of, 140
Morel, E. D., Red Rubber: Story of the Rubber Slave Trade on the Congo, 104 †
Moreno, F. P., Medal awarded to, 566
Moresnet—
Grenzstreitige Gebiet von Moresnet: A. Kirchhoff, 100 †
Morgan, A., Practical Teaching of Geography in Schools and Colleges, 478 †
Morié, L.-J., Histoire de l'Éthiopie (Nubie et Abyssinie), 105 †
Morison, T., Industrial Organisation of an Indian Province, 102 †, 454 §
Morocco—
Dans le Bled es Siba. Explorations au Maroc: L. Gentil, 447 §
Description géographique du Maroc d'Az-Zyâny: E. Confourier, 105 †
Futuros ferrocarriles de Marruecos: P. G. Faria, 473 †
Maps: Carte du Maroc (Service Géo. de l'Armée), 245
Maroc, Le: J. Leclercq, 688 †
Mission Buchet. Rapport sommaire d'ensemble: G. Buchet, 473 †
Mission hydrographique française au Maroc: H. Froidevaux, 105 †
Population du Maroc: N. Larras, 105 †
Tribus arabes de la vallée du Lekkoûs: E. Michaux-Bellaire et G. Salmon, 105 †
West Coast, Hydrographical Survey, A. H. Dyé's report, 226

Mosquito territory—
Treaty between the United Kingdom and Republic of Nicaragua with regard to Mosquito Territory, 360 †
Moss, C. E., Grant awarded to, 567
Mossman, R. C., Some Meteorological Results of Scottish National Antarctic Expedition, 586 †; J. H. Pirie, and R. N. R. Brown, The Voyage of the *Scotia*, 78 §
Most, K., Wirtschaftliche Entwickelung Deutsch-Ostafrikas, 472 †
Moulton, F. R., An introduction to Astronomy, 109 †
Mounds—
Natural Mounds: M. A. Campbell, 691 †
Mountain building—
Abyssal Igneous Injection as a Causal Condition and as an effect of Mountain-building: R. A. Daly, 588 †
Mountain Sickness and its Probable Causes: T. G. Longstaff, 577 §, 693 †
Mozambique—
Companhia de Moçambique, 105 †
Mud-cracks—
Sedimentation, Mud-cracks as a Criterion of, J. Barrell on, 351
Mueller glacier, New Zealand, 349
Muhavura peak, height of, 310, 311
Mumia's, rainfall at, 656
Murchison and Davenport ranges, Central Australia, A. A. Davidson on characteristics of, 229
Murman coast—
Pêcheries de la Côte Mourmane, Aperçu sur l'Expédition scientifique pour l'exploration des: L. L. Breitfuss, 581 †
Russian Hydrographical Survey of, 642
Murray, E. M., Photographs of British East Africa, 368 †
Murrumbidgee valley, Irrigation scheme for the, J. P. Thomson's report on, 230
Musil, A., Karte von Arabia Petraea, 243 †, 345 §
Mweru, Lake, Rhodesia, 372
Mylius, A. Freiherrn von, Reise nach Kaffa und Da'uro, 687 †

N.

Nairobi, rainfall at, 656
Naivasha, Lake, Heights of, 318
Nampa glaciers, Himalaya, 203
Nansen, F., Northern Waters, 690 †; remarks on "To the North Magnetic Pole and through the North-West Passage," 514
Napoleon, Campaigns of: J. M. Maguire, 693 †
Nascaupee river, Labrador, 349
Natal—
Geological Survey of Natal and Zululand, Reports: W. Anderson, 71 §
Maps: Colony of Natal (Surveyor-General, Natal), 115 †
Nathorst, A. G., Phyllotheca-Reste aus den Falkland-Inseln, 360 †
Natron See, German East Africa, 257
Natural bridges—
Naturbrücken und verwandte Formen: J. Früh, 691 †
Nechjilli Eskimo, 502, 505
Negeb—
Cities in the Negeb, and Tribal Boundaries: C. Hauser, 103 †
Negro, Rio—
Reisen in Jauapiry Gebiet: R. Payer, 585 †
Neligan, C. W., Photograph of Mount Kenya, 700 †
Neptune, Cruise of the: A. P. Low, 449 §
Nérot, A., Nord et l'Est de la France et les Voies d'Accès au Simplon, 100 †
Neumann, L., Deutschlands mittlere Jahres-Temperaturen, 100 †
Neumann, R., Nordafrika (mit Ausschluss des Nilgebietes) nach Herodot, 447 §
Nevada—
Deserts of Nevada and the Death Valley: R. H. Chapman, 585 †
Truckee-Carson Irrigation Project, 409
New Guinea—
British: Annual Report of the Administrator, 91
Explorations by R. Pöch, 350
German: Erster Bericht von meiner Reise nach Neu-Guinea: R. Pöch, 360 †; Ost- und Süd-Neu-Guinea, Bemerkungen ueber die Eingeborenen von: R. Pöch, 360 †; R. Schlechter's proposed expedition, 350
Southern: H. Lorentz' proposed expedition, 350
New Hebrides—
Convention between France and Great Britain, 230
Convention between United Kingdom and France, 1906 . . . respecting the New Hebrides, 690 †
Nouvelles Hébrides de 1606 à 1906: G. Bourge, 475 †
New Mexico—
Physiography of: C. R. Keyes, 585 †
Rio Grande irrigation project, 410
New South Wales—
Molybdenum: E. C. Andrews, 360 †
New Zealand—
Adrift in New Zealand: E. W. Elkington, 108 †
Earthquakes, Brief Notes on Theory of: G. Hogben, 586 †
Flora, Manual of: T. F. Cheeseman, 109 †
Forests, State, 1905-06. Report on the Department of Lands: W. C. Kensington, 586 †
Geysers of, 352
Glacier movements, measurements of, 349
Maori Place-names: J. Cowan, 586 †
Physiographic Section through the Middle Island of New Zealand: J. M. Bell, 108 †

New Zealand—*continued.*
Subalpine Scrub of Mount Fyffe (Seaward Kaikouras): L. Cockayne, 92 §, 475 †
Surveys, 1905–06. Report on the Department of Lands: T. Humphries, 586 †
Ngangon-tso, Tibet, 344
Ngangtse-tso, Tibet, 541, 542
Ngan-hui province, China, 279
Nguru—
Maps: Karte des südlichen Teiles der Nguru-Berge: M. Moisel, 245 †
Nguruman Masai, East Africa, 258
Niagara—
Survey of, by J. W. Spencer, 227
Whirlpool Rapids, waves in the, 30
Nidderdale—
Upper Nidderdale, with the Forest of Knaresborough: H. Speight, 357 †, 453 §
Nielsen, J. N., Contributions to Hydrography of Waters North of Iceland, 587 †
Niermeyer, J. F., De regenval aan de vlakke kusten van Java, 687 †
Nigeria—
Boundary between Nigeria and Dahomé, Treaty of 1907..569
Boundary between Nigeria and the Kamerun, Agreement of 1906..458
Convention between United Kingdom and France respecting the Frontier . . . to the East of the Niger, 238 †
Lower Niger and its Tribes: A. G. Leonard, 105 †, 449 §
Northern, D. Cator's surveys in, 345
Southern, Structure of: J. Parkinson, 56 *
Nile—
Rains of the Nile Basin in 1905: H. G. Lyons, 105 †, 340 §
Silt of the, 428
Snows of the Nile: H.R.H. the Duke of the Abruzzi, 121 *
Triangulation of the Nile valley, 443
Niox, G., Algérie et Tunisie (map), 591 †
Nopcsa, Baron, Utazások Éjszak Albaniában (map), 694 †
Norrland; Naturbeskrifning: A. G. Högbom, 470 †
North Magnetic Pole: *see* Arctic
North Sea—
Faunistisch-biologische Untersuchungen über Amphipoden der Nordsee: J. Reibisch, 240 †
Fishery Investigations. Reports of British Delegates to International Council for Exploration of the Sea, 589 †, 692 †
Oberflachentemperaturbeobachtungen in der Nordsee 1903–1904: E. van Everdingen, 589 †
North-West Passage, To the North Magnetic Pole and through the: R. Amundsen, 485
Norway—
Fiords of: A. P. Brigham, 236 †
Gamle norske ønavn Njarðarlog: M. Olsen, 237 †
Histoire de la Civilisation. La Suède et la Révolution Norwégienne: A. Mohn, 237 †
Indlands-og Kystbefolkningens Legemshøide, etc.: A. og H. Daae, 236 †
Klima- und Gletscherschwankungen in Norwegen: A. P. Øyen, 237 †
Magnetiske Misvisning i Norge: H. Geelmuyden, 237 †
Maps: Generalkarte over det sydlige Norge (Norges Geografiske Opmaaling), 480 †; Specialkarte over den norske kyst (Norges Geographiske Opmaaling), 483 †
Norwegian Landslip: A. P. Brigham, 469 †
Nova Scotia—
Journal of a Voyage to Nova Scotia made in 1731 by Robert Hale of Beverly, 584 †
Maps: Geological Survey of Province of Nova Scotia (Geol. Survey Office), 592 †
Novaya Zemlya—
Russian Hydrographical Surveys, 632, 644
Nyasa, Lake—
Heights of, 316
Level, Fall of, letter from A. Sharpe on, 466

O.

Ob river—
Fahrt nach dem Ob und dem Jenissei im Jahre 1905: J. Herrmann, 103 †
Oban hills, South Nigeria, physiography of, 58
Obatogaman river, Quebec, 91
Oberhummer, E., und F. R. von Wieser, Wolfgang Lazius Karten der österreichischen Lande und des Königreichs Ungarn aus den Jahren 1545–1563.. 362 †
Obrucheff, V. A., Explorations in the region of the Tarbagatai, 457
Oceanographical laboratory at Edinburgh, 234
Oceanography—
Chemical Evolution of the Ocean: A. C. Lane, 239 †
Conseil Permanent International pour l'Exploration de la Mer, 239 †
Dead Water, On: V. W. Ekman, 240 †
Formación de tierras en el seno de las aguas: V. Vera, 476 †
Forschungsreise S.M.S. *Planet*, 240 †
Mareografo d'alto Mare del Comandante Mensing: L. Marini, 240 †
Museum für Meereskunde in Berlin, Das neue: P. Dinse, 476 †
Oceanic Depths and Serial Temperature Observations during 1905..240 †

Oceanography—*continued.*
Studienfahrt des Instituts für Meereskunde zu Berlin, Die Zweite: L. Brühl, 476 †
Oestreich, K., Täler des nordwestlichen Himalaya, 471 †
Ogawa, T.: *see* Inouye, K.
Ogowe—
French Railway Route up Ogowe valley, 348
Recherches sur l'histoire des migrations dans le bassin de l'Ogôoué et la région littorale adjacente: R. Avelot, 460 §, 688 †
Ohio—
Ohio River; a Course of Empire: A. B. Hulbert, 107 †
Oldham, R. D., Constitution of Interior of the Earth, as revealed by Earthquakes, 361 †; remarks on "Cutch and the Ran," 537
Olivieri, B., Veduti degli avanzi dei monumenti antichi delle due Sicilie, 113 †
Ollone, D', Expedition to Western China, 225
Olsen, M., Det gamle norske ønavn Njarðarlog, 237 †
Omori, F., Note on the San Francisco Earthquake of April, 1906..585 †
Ontario—
Maps: Topographic map of Ontario (Dept. of Militia and Defence), 592 †
Ophir—
Ophir: J. F. A. McNair, 478 †
Orange River Colony—
Maps: Orange River Colony and Basutoland (Surveyor-General's Office), 245 †
Ordnance Survey Maps of England and Wales, 113 †, 242 †, 363 †, 479 †, 590 †, 694 †
Orleans, Duke of, Expedition to North-East Coast of Greenland, 93
Orography—
Orography and History: E. W. Dann, 478 †
Oshima, J., Sketch of Eastern Taiwan, 471 †
Oswald, F., Treatise on the Geology of Armenia, 357 †
Outram, J., in the Heart of the Canadian Rockies, 106 †
Owens, J. S., remarks on "Cutch and the Ran," 538
Øyen, A. P., Klima- und Gletscherschwankungen in Norwegen, 237 †

P.

Pacific ocean—
German Hydrographical Surveys in the Western Pacific, 679
Maps: Pilot Chart of North Pacific Ocean (U.S. Hydrographic Office), 118 †, 248 †, 368 †, 483 †, 595 †, 700 †
Namen der ozeanischen Inselgruppen: T. Arldt, 690 †
Parallelismus der Inselketten Ozeaniens: T. Arldt, 475 †
Pacific ocean—*continued.*
Planet, survey work of, 575
Plant-dispersal: H. B. Guppy, 340 §
Russian Hydrographical Surveys, 635, 648
Vulkan im Stillen Ozean, Ein neuer: R. Deeken, 109 †
Pagla Dia river, North India, 87
Pai-ch'a, Chih-Li province, 186
Pai-hua Shan, China, 199
Paillot, R., Le Limousin, 100 †
Paita, Ferrocarril de, al Marañón: E. C. Zegarra, 586 †
Palestine—
Arab and Druze at home: W. Ewing, 454 §, 472 †
Handbook for Palestine and Syria (Th. Cook & Son), 454 §
Palma—
Kenntnis von Palma und Lanzarote, Beiträge zur: K. Sapper, 358 †
Panama—
Boundary between Costa Rica and Panama, Agreement of 1907..572
Isthmus von Panama: E. S. Fischer, 360 †
Panama to Patagonia: C.M. Pepper, 108 †
Routes to Western South America, A comparison of the Panama and Magellan, 586 †
Tides at Panama, Early knowledge of: R. A. Harris, 108 †
Pangani river, Steppe to west of, 226
Pangong—
Glacial lake in the Tibetan plateau: E. Huntington, 456 §, 583 †
Paniagua, A. de, Note sur le Moustérien dans l'Europe Occidentale, 470 †
Pápay, J., Im Lande der Nord-Ostjaken, 103 †
Papinot, E., Dictionnaire d'histoire et de géographie du Japon, 471 †
Pappenheim, Graf zu, Madagascar; Studien, Schilderungen und Erlebnisse, 359 †, 666 †
Paraguay—
Geografía de la República del Paraguay: H. F. Decoud, 474 †
Paraguay; das Land der Guaranis: W. Vallentin, 474 †
Paraguay river—
Crecientes del Rio Paraguay: J. S. Decoud, 108 †
Parallelism—
Parallelismus auf der Erdoberfläche: T. Arldt, 361 †
Parkinson, J., Structure of Southern Nigeria, 56 *
Partsch, J., Von der deutschen Grenzwacht in Schlesien, 101 †
Passerat, C., Pluies de Mousson en Asie, 582 †
Pattenhausen, B., Anteil der Vereinigten Staaten an der Erforschung der Erdgestalt durch Gradmessungen, 691 †
Pavie, A., Mission Pavie Indo-Chine, 1879–1895. Exposé des Travaux de la Mission, 357 †

Pawlowski, A., Plus anciens hydrographes français (XVI^e siècle), Jean Fonteneau, 589 †; Transformations du littoral français, 580 †
Payer, R., Reisen in Jauapiry-Gebiet, 585 †; Rio Jauapery, Brasilien (Map), 115 †
Payette-Boise Irrigation project in Idaho, 411
Peary, R. E., Arctic Expedition, 97, 575
Pécsi, A., Grundzüge der geometrischen Theorie der Erdbeben, 476 †
Peking—
  Journey across Asia from Leh to Peking: C. D. Bruce, 597 *
  Peking-Hankow Railway, 686 †
Pelée, Mont—
  Rock of the Pelée Obelisk and condition of Volcano in February, 1906: A. Heilprin, 585 †
  Shattered Obelisk of Mont Pelée: A. Heilprin, 585 †
Pelew islands, deep troughs on oceanic side of, 679
Pelliot, M., Expedition in Central Asia, 87, 223
Pennsylvania—
  Falckner's Curieuse Nachricht von Pennsylvania: J. F. Sachse, 238 †
Penzler, J., Ritters geographisches-statistisches Lexikon über die Erdteile, etc., 241 †
Pepper, C. M., Panama to Patagonia, 108 †
Perera, A. A., Note on Maldivian History, 471 †
Persia—
  British Indian Commercial Mission to South-East Persia, Report: A. H. Gleadowe-Newcomen, 212 §
  Maps: Routenkarte von Bachdād nach Sīrāz durch Luristan, etc.: E. Herzfeld, 591 †, 696 †
  Persia Past and Present: A. V. W. Jackson, 74 §, 103 †
Peru—
  Ferrocarril de Paitá al Marañón: E. C. Zegarra, 586 †
  Indigenas é Immigrantes (en el Perú): L. Pesce, 586 †
  Minerales de las provincias de Jauja y Huancayo: E. I. Dueñas, 474 †
  Región Cuprífera de los Alrededores de Ica y Nazca: F. G. Fuchs, 475 †
  Route to Plain of the Amazon, New Peruvian: S. J. Bailey, 585 †
Pesce, L., Indigenas é Immigrantes (en el Perú), 586 †
Petersen, C. G., Report of Danish Biological Station to Board of Agriculture, 355 †
Petre, F. L., Republic of Colombia, 217 §
Petrie, W. M. F., and C. T. Currelly, Researches in Sinai, 104 †
Petroleum—
  Geographical Distribution and Geological Occurrence of Petroleum and Natural Gas, A Treatise on the: Sir B. Redwood, 477 †, 565 §
Pettersson, O., L'Atlantique, mer inexplorée, 239 †
Philippson, A., Ein Gletscher am Erdschias-Dagh in Kleinasien, 103 †
Philips' Handy Volume Atlas: E. G. Ravenstein, 593 †; Progressive Atlas of Comparative Geography: P. H. l'Estrange, 365 †
Photographs—
  Africa, British East: E. M. Murray, 368 †
  Africa, British and German East: R. G. T. Bright, 119 †
  Alaska and British Columbia: N. Maclaren, 700 †
  Asiatic Turkey: H. E. W. Young, 118 †
  Asiatic Turkey and Persia: H. W. Cadoux, 119 †
  Burma, Upper: G. Sowman, 120 †
  Clapperton Memorial: J. A. Burdon, 368 †
  Færöe Islands: D. Hepburn, 368 †
  India, China, and Japan: H. G. Ponting, 595 †
  Kashmir: E. MacI. Ritchie, 248 †
  Kenya, Mount: C. W. Neligan, 700 †
  Malay Peninsula: F. Adam, 595 †
  Mongolia, or Outer Chih-li: J. Hedley, 483 †
  Punjab: C. MacI. Ritchie, 595 †
  Sahara: M. W. Hilton-Simpson, 596 †
Physiography—
  Physiography and Geography: G. D. Hubbard, 112 †
Pickering, W. H., On Causes of Irregular Distribution of Land and Water on the Earth, 576
Pilcomayo—
  Exploration by W. Herrmann of middle course of the, 461
  Maps: River Pilcomayo from parallel 22° S. to River Paraguay: G. Lange, 482 †
Pilgrim, G., Observations on Geology of the Outer Himalayas, 86
Piltz, E., Geländeform des Jenaer Schlachtfeldes, 100 †
P'i-mo—
  Hsüan-Tsung's Notice of P'i-mo and Marco Polo's Pein: M. A. Stein, 686 †
P'ing-hsing-kuan, China, 274
Pirie, J. H.: *see* Mossman, R. C.
Pittard, E., Influence du milieu géographique sur le développement de la taille humaine, 692 †
Pitt-Rivers, A., Evolution of Culture and other Essays, 111 †
Planet, S.M.S.—
  Forschungsreise, 240 †
  Voyage of, Hydrographical Work: A. Krämer, 94, 575
Planimetry—
  Geschichte der geographischen Flächenmessung bis zur Erfindung des Planimeters: W. Schmiedeberg, 109 †

Plankton—
Plantes et d'animaux observées dans le plankton, Catalogue des espèces de, 240 †
Plants—
Lichtgenuss der Pflanzen im Yellowstonegebiete, etc., Untersuchungen über den: J. Wiesner, 474 †
Plant-dispersal in the Pacific: H. B. Guppy, 340 §
Subalpine Scrub of Mount Fyffe: L. Cockayne, 92 §, 475 †
Plate, A. G., Cruise through Eastern Seas, 455 §; "Lloyd" Guide to Australasia, 108 †
Platte river Irrigation Project, 412
Pobeguin, E., Reconnaissance du Sebou par la mission Dyé, 688 †
Pöch, R., Bemerkungen ueber die Eingeborenen von Ost- und Süd-Neu-Guinea, 360 †; Erster Bericht von meiner Reise nach Neu-Guinea, 360 †; Explorations in New Guinea, 350
Polar Ocean—
Russian Hydrographical Surveys, 636, 642
Polar Problems and the International Organization for their Solution: H. Arctowski, 691 †
Pole—
Nordpolens rörelse: A. P. Rosén, 110 †
Ponting glacier, Himalaya, 202
Ponting, H. G., Photographs of India, China, and Japan, 595 †
Poor Knights Islands—
Botanical Visit to the Poor Knights Islands, Notes on a: L. Cockayne, 92 §, 475 †
Porena, F., Primo documento intorno a un Di Gioia amalfitano, 589 †
Porsild, M. P., Naturvidenskabelige Station ved Vassijaure i Torne Lapmark, 237 †
Porto Rico—
Climatology of Porto Rico from 1867 to 1905: W. H. Alexander, 690 †
Porvenir, position of, 574
Posen—
Einfluss der staatlichen Besiedlung in Posen und Westpreussen auf die Sprachenzugehörigkeit der Gemeinden: H. Wendland, 100 †
Potonié, H., Fichte als Moorbaum und über unsere Moore, 240 †
Poulton, E. B., on Work and Life of W. J. Burchell, 578
Powell-Cotton, P. H. G., Expedition in the Congo Forest, 346
Praslin island, Seychelles, 151
Pratt, E. A., British Canals. Is their Resuscitation Practicable? 102 †, 219 §
Prinz, J., Reiseskizzen aus Central-Asien, 471 †, 686 †
Proot, J. M., Vacantie-excursie voor geografen door Zeven-gebergte en Eifel, 580 †
Prudent, F.: *see* Schrader, F.
Prussia—
Vacantie-excursie voor geografen door Zeven-gebergte en Eifel: J. M. Proot, 580 †
Wald und Niederschlag in Westpreussen und Posen und die Beeinflussung der Regen- und Schneemessung durch den Wind: J. Schubert, 685 †
Pueblo Environment: W. Hough, 106 †
Pullé, F. L., Cartografia antica dell' India, 446 §
Punjab—
District Gazetteers. Hoshiarpur District, 471 †
Photographs of: C. M. Ritchie, 595 †
Purchas, S., Hakluytus Posthumus or Purchas His Pilgrimes, 241 †, 362 †
Putzger, F. W., Historischer Schul-Atlas zur alten, mittleren und neuen Geschichte, 366 †
Pyrenees—
Études d'economie pastorale dans le Pyrénées: P. Descombes, 685 †
Propriété communale dans les Pyrénées et l'aménagement des montagnes par l'initiative privée: P. Descombes, 237 †

Q.

Quast, H. C. E., Verslag nopens den politieken toestand in de Rokanstaatjes, 471 †
Quebec—
Chibougaman Mining Region in Northern part of Province of Quebec, Report: A. P. Low, 90 §, 360 †
Quevedo, S. A. L., and P. N. Armentia, Los Indios Mosetenes y su lengua, 689 †
Quito—
French Geodetic Expedition to measure the Quito Arc, Notes on Work of the, 211

R.

Rabot, C., Abaissement du niveau de la nappe aquifère en Beauce, 100 †; Débacles glaciaires, 588 †; Variations des glaciers de l'Islande méridionale de 1893–1894 à 1903–1904..581 †
Radium—
Distribution of Radium in the Earth's Crust. Part II. Sedimentary Rocks: Hon. R. J. Strutt, 110 †, 475 †
Rainfall—
East Africa Protectorate, Rainfall of the: G. B. Williams, 654 *
Rainfall of Suffolk and the East Riding: H. R. Mill, 222 §, 686 †
Ran of Cutch, Formation of, 525
Randall-MacIver, D., Mediæval Rhodesia, 473 †
Rastall, R. H., and B. Smith, Tarns on the Haystacks mountain, Cumberland, 343 §, 686 †

Ravenstein, E. G., Philips' Handy-Volume Atlas of the World, 593 †
Rawak Stupa, Central Asia, excavations at, 33
Raymond, —, Considérations sur la Carte de France, 99 †
Reclus, E., L'Homme et la Terre, 111 †; Plan for Large Relief Globes, 4
Redway, J. W., Some Notes on the San Francisco Earthquake, 436 *
Redwood, Sir B., Petroleum: a Treatise on the Geographical Distribution and Geological Occurrence of Petroleum and Natural Gas, 477 †, 565 §
Regel, F., Reste der Urbevölkerung (Indios bravos) in der Kolumbischen West-Kordillere, 108 †
Reibisch, J., Faunistisch-biologische Untersuchungen über Amphipoden der Nordsee, 240 †
Reid, H. F., Variations of Glaciers, 475 †; et M. Muret, Variations périodiques des glaciers, 692 †
Reinecke, F., Vulkan auf Savaii, 109 †
Renaissance—
Geographie des Renaissancezeitalters, Poggio Bracciolini und Nicolò de Conti in ihrer Bedeutung für die: W. Sensburg, 589 †
Rennell, J., der Schöpfer der neueren Englischen Geographie: C. A. Frenzel, 478 †
Research Department of R.G.S., C. F. Close on Work of the, 233
Reviews—
Abyssinia and British East Africa, Sport and Travel: Lord Hindlip, 556
Abyssinia of To-day, 76
Africa. Mission Scientifique du Bourg de Bozas, 77
Africa. Nordafrika (mit Ausschluss des Nilgebietes) nach Herodot: R. Neumann, 447
Africa, Notes on the Geology of the Continent of: A. Knox, 78
Africa, Portuguese East: R. C. F. Maugham, 216
Algiers and Beyond: M. W. Hilton-Simpson, 447
Antarctic. Le "Français" au Pôle Sud: J. B. Charcot, 450
Australia, Coming of the British to: I. Lee, 667
Australia, Natives of: N. W. Thomas, 450
Bird, Isabella (Mrs. Bishop), Life of: A. M. Stoddart, 452
Britain and the British Seas: H. J. Mackinder, 334
British Canals: E. A. Pratt, 219
British Malaya: Sir F. Swettenham, 335
Carte d'America di Giacomo Gastaldi: S. Grande, 670
Colombia, Republic of: F. L. Petre, 217
Reviews—*continued.*
Côte d'Ivoire, Dix ans à la: F. J. Clozel, 557
Desert and the Sown: G. L. Bell, 445
Ecuador, In den Hoch-Anden von: H. Meyer, 558
Eiszeit, Die: F. E. Geinitz, 452
Europe, A Cruise across: D. Maxwell, 444
Geography, Comparative, a Progressive Course of: P. H. L'Estrange, 560
Geography, Elementary Studies in: H. J. Mackinder, 560
Geography, Modern, Dawn of: C. R. Beazley, 81
Glacial Motion, Viscous *versus* Granular Theory of: O. W. Wilcox, 559
Graham Land, On the Geology of: J. G. Andersson, 668
Hawaii, Ostmikronesien, und Samoa: A. Krämer, 668
Höhlenkunde, mit Berücksichtigung der Karstphänomene: W. von Knebel, 451
India: P. Loti. Translated by G. A. F. Inman, 216
India, N., Native Races of the British Empire: W. Crooke, 665
India, Cartografia antica dell': F. L. Pullé, 446
India, Climatological Atlas of: Sir J. Eliot, 336
India, The Tourist's: E. Reynolds-Ball, 454
Khasis, The: P. R. T. Gurdon, 665 §
Lotus Land; Account of Country and People of Southern Siam: P. A. Thompson, 216
Madagascar: Graf zu Pappenheim, 666
Malay Peninsula, Pagan Races of the: W. W. Skeat and C. O. Blagden, 555
Mexiko und seine Kulturfortschritte, Das heutige: P. George, 78
Morocco. Dans le Bled es Siba Explorations au Maroc: L. Gentil, 447
Neptune, Cruise of the: A. P. Low, 449
Niger, Lower, and its Tribes, 449
Nile Basin, Rains of the: H. G. Lyons, 340
Ocean and Inland Water Transportation: E. R. Johnson, 219
Oxford Geographies: A. J. Herbertson, 560
Pacific, Observations of a Naturalist in the, Plant-dispersal: H. B. Guppy, 340
Persia, Past and Present: A. V. W. Jackson, 74
Petroleum: Sir B. Redwood, 565
Plattensees, Resultate de wissenschaftlichen Erforschung des, 554
Scotia, Voyage of the, 78
Tibet the Mysterious: Sir T. H. Holdich, 74
Tibet, Western, A Summer Ride through: J. E. Duncan, 75

Reviews—*continued.*
Varenius: S. Günther, 218
Vulcangebieten Mittelamerikas und Westindiens, In dem: K. Sapper, 558
Waterways, Our: U. A. Forbes and W. H. R. Ashford, 219
World of To-day: A. R. H. Moncrieff, 671
Reynolds-Ball, E., Tourist's India, 454 §, 687 †
Rezzoûk, A., Notes sur le Rif, 105 †
Rheden, J., observations on Height of Clouds measured by Reflectors, 233
Rhine basin—
Entwickelungsgeschichte der gegenwärtigen phanerogamen Flora und Pflanzendecke der Oberrheinischen Tiefebene und ihrer Umgebung: A. Schulz, 580 †
Rhodesia—
Geodetic Survey in, 396
Geology of, Notes by L. A. Wallace, 389
Kansanshi Mine, Reports on, 90 §, 583 †
Mediæval Rhodesia: D. Randall-MacIver, 473 †
North-Eastern Rhodesia: L. A. Wallace, 369 *; Maps: North-Eastern Rhodesia. Provisional Map: O. L. Beringer, 591 †; Wisa Handbook; a short Introduction to the Wisa Dialect: A. C. Madan, 359 †
North-Western Rhodesia, Mineral Belt in, 90
Southern, Geology of: F. P. Mennell, 72 §
Rhone—
Ablation der Rhone in ihrem Walliser Einzugsgebiete im Jahre 1904–05: E. Uetrecht, 237 †
Riberalta, Position of, 574
Richarz, S., Die Gesteine des Profils durch das Bayum-Kol-Tal im nördlichen Teil des Zentralen Tian-Schan, 357 †
Richter, E., Historical Atlas of the Alpine Provinces of Austria, 673 §
Richter—
Eduard Richters Leben und Wirken: R. Marek, 112 †
Riff—
Notes sur le Rif: A. Rezzoûk, 105 †
Rift-valley escarpments. East Africa, 256, 347; rainfall of, 659
Rio de la Plata, Etnografia del: B. T. Martinez, 239 †
Rio Grande Irrigation Project in New Mexico, 410
Ritchie, E. MacI., Photographs of Kashmir, 248 †; Photographs of the Punjab, 595 †
Ritters geographisches-statistisches Lexikon über die Erdteile, etc.: J. Penzler, 241 †
Rivers—
Progressive Waves in Rivers: V. Cornish, 23 *
Robinson, H. H.: *see* Gregory, H. E.
Rock Folds due to Weathering: M. R. Campbell, 691 †
Rocky mountains—
Camp Fires in the Canadian Rockies: W. T. Hornaday, 106 †
Heart of the Canadian Rockies, In the: J. Outram, 106 †
Rome—
Journeys to Rome and Naples, 1817, Five MS. volumes describing: — Mitchell, 113 †
Roma ricercata nel suo sito: F. Martinelli, 113 †
Roosevelt, T., President U.S., on election as Honorary Member of the R.G.S., 342
Rosén, A. P., Nordpolens rörelse, 110 †
Ross, M., First traverse of Mount Cook, 586
Rossetti, C.—
Corea and Corcani, 358 †
Schizzo dimostrativo della Colonia del Benadirredatto, 115 †
Schizzo dimostrativo della situazione politica nell' Affrica Orientale, 364 †
Schizzo dimostrativo delle principali concessioni per ricerche minerarie accordate dall' Imperatore Menelik II. in Etiopia, 364 †
Schizzo dimostrativo delle vie di comunicazione fra l'Eritrea il Sudan e l'Etiopia, 115 †
Tre note sulla città di Mogadiscio, 688 †
Roth, F.: *see* Koernicke, M.
Royal Geographical Society—
Christmas Lectures, 235
Medals and Awards for 1907..566
Meetings, Session 1906–1907..96–98, 235, 354, 468, 579, 684
Research Department, Meetings of, 98, 354, 468, 683; C. F. Close on Work of the, 233
Royal Scottish Geographical Society, Address to: Sir G. T. Goldie, 1 *
Rudolph, E., Ostasiatischer Erdbebenkatalog, 357 †
Ruge, W., Ein Globus von Gemma Frisius, 589 †
Rugen—
Strelasund und Rügen: W. Deecke, 343 §, 580 †
Rumania—
Distributiunea geografică a petroleului în țara noastră: C. R. Mircea, 237 †
From Carpathian to Pindus: pictures of Rumanian country life: T. Stratilesco, 453 §, 470 †
Ruppin, E., Bestimmung der elektrischen Leitfahigkeit des Meereswassers, 692 †
Russell, I. C. (biography): G. K. Gilbert, 693 †
Russell, R. V., Central Provinces District Gazetteers, 471 †
Russia—
Deutschen in Russland: E. Hasse, 237 †
Russian Hydrographical Survey, Short

Account of the: J. de Schokalsky, 626 *
Russian Turkestan—
Reiseskizzen aus Central-Asien. I. Aus Fergana in das Narin-Becken: J. Prinz, 471 †
Ruwe gold-mine, Rhodesia, 90
Ruwenzori—
Ascents attempted, 122, 123
Conquest of Ruwenzori; a Note: D. W. Freshfield, 326
Glacial action on, 328
Glaciers of, 144
Heights of, 309, 319
Peaks of, 140
Snows of the Nile: Duke of the Abruzzi, 121 *
Towards Ruwenzori: D. W. Freshfield, 238 †

S.

S——, P. P. v., De seldsaame en noit gehoorde Wal-Vis-Vangst, 113 †
Saavedra, B., Defensa de los Derechos de Bolivia ante el Gobierno Argentino en el Litigio de Fronteras con la Republica del Peru, 360 †
Sabi river, Mashonaland, 15–17
Sachse, J. F., Falckner's Curieuse Nachricht von Pennsylvania, 238 †
Sachu or Tung Huang, 618
Sahara—
Expedition to Taodeni under Captain Cauvin and Lieut. Cortier, 347
Journey across the Sahara, H. Vischer's, 88
Ouargla au Tidikelt et vers Tombouctou: N. Villatte, 106 †
Pénétration Sahrienne (1830–1906): A. Bernard et N. Lacroix, 106 †
Photographs of: M. W. Hilton-Simpson, 596 †
Saillard, M., En traversant la République de Costa-Rica, 689 †
St. Helena—
Longitude of, 226
Prise de possession de Saint-Hélène par la Grande-Bretagne au XVII^e^ siècle: H. Dehérain, 473 †
Saint-Jours, —, Lège, le Porge, et les fables du littoral gascon, 356 †
St. Martin, V. de, et F. Schrader, Atlas Universel de Géographie, 246 †
St. Maurice conduit, roll-waves in, 27
Salmon, —, Geographical and Astronomical Grammar, 113 †
Salmon, G.: *see* Michaux-Bellaire, E.
Salt river irrigation project, 407
Salton Lake—
Formation of: C. A. Byers, 461
Saltonsee, Californian, Oktober, 1906: H. Erdman, 481 †
Salzkammergutes—
Seichesbeobachtungen an den grösseren Seen des: A. Endrös, 685 †
Samec, M., Durchsichtigkeit der Luft bei verschiedenen Witterungszuständen in Wien, 476 †
Samoa—
American Samoa: V. L. Kellogg, 475 †
Samoa, Hawaii, und Ostmikronesien: A. Krämer, 361 †
Vulkan auf Savaii: F. Reinecke, 109 †
Vulkan im Stillen Ozean, Ein neuer: R. Deecken, 109 †
Vulkanische Tätigkeit auf Savaii: W. v. Bülow, 109 †
Samothrace—
Besteigung des Phengari auf Samothraki: V. Schleiff, 237 †
Sandman, J. A., Uebersicht ueber die Seefischerei Finnlands, 470 †
San Francisco—
California, Great Fault of, and the San Francisco Earthquake, April, 1906: E. P. Carey, 689 †
Earthquake, Geological prelude to: G. H. Ashley, 474 †; Earthquake, April, 1906, Investigation of: G. K. Gilbert, 584 †; Local effects of the: S. Taber, 107 †; Note on the: F. Omori, 585 †; Ditto: G. Davidson, 689 †; Notes on the: J. W. Redway, 436 *; Points of Interest involved in the: G. Davidson, 689 †
Origines de San Francisco et la découverte de l'or: C. Chanel, 107 †
Significance of: H. Scheffauer, 585 †
Santa Catharina—
Maps: Spezialkarte von Santa Catharina, Rio Grande do Sul und Uruguay: R. Jannasch, 482 †
San Thomé—
Relatorio do Dr. Strunk sobre una viagem a S. Thomé, 473 †
São Paulo—
Coffee Production in, letter from F. H. Sawyer on, 353
Sapper, K. (*see also* Krebs, W.)—
Beiträge zur Kenntnis von Palma und Lanzarote, 358 †
Einfluss des Menschen auf die Gestaltung des mexikanischmittelamerikanischen Landschaftsbildes, 108 †
Geologie von Chiapas und Tabasco, 584 †
In dem Vulcangebieten Mittelamerikas und Westindiens, 558 §
Kanarischen Inseln. Eine geographische Studie, 583 †
Sardeson, F. W., Folding of Subjacent Strata by Glacial Action, 109 †
Satō, D., Geographical Trip to the New Sulphur Island, 471 †
Savaii—
Reise nach Savaii zur Besichtigung des dortigen, im August 1905 entstandenen Vulkans, Bericht über eine, 586 †
Vulkan auf Savaii: F. Reinecke, 109 †
Vulkanische Tätigkeit auf Savaii: W. v. Bülow, 109 †
Savoia peak, Ruwenzori, height of, 139

Savoy—
Glacier des Evettes en Maurienne: P. Girardin, 100 †
Sawyer, F. H., letter from, on Coffee Production in São Paulo, Brazil, 353 †
Saxony—
Herkunft der deutschen Siedler im Konigreich Sachsen nach den Ortsnamen und Mundarten: A. Meiche, 100 †
Scandinavia—
Entwickelungsgeschichte der skandinavischen Flora: G. Andersson, 581 †
Schardt, H., Note sur l'origine des sources vauclusiennes de la Doux et de la Noiraigne, 237 †
Scheffauer, H., The significance of San Francisco, 585 †
Schelde river system, Belgium, 567
Schenck, H.: *see* Karsten, G.
Schillings, C. G., Zauber des Elelescho, 104 †
Schlagintweit, M., Verkehrswege und Verkehrsprojekte in Vorderasien, 472 †
Schlechter, R., Expedition to German New Guinea, 350
Schleiff, V., Eine Besteigung des Phengari auf Samothraki, 237 †
Schlobach, —, remarks on "From the Victoria Nyanza to Kilimanjaro," 270
Schlüter, O., Ziele der Geographie des Menschen, 477 †
Schmiedeberg, W., Geschichte der geographischen Flächenmessung bis zur Erfindung des Planimeters, 109 †
Schokalsky, J. de, A short account of the Russian Hydrographical Survey, 626 *; Sur la formation de la glace de fond, 588 †
Schott, G., on hydrographical surveys in the Western Pacific, 679
Schrader, F. (*see also* St. Martin, V. de), Année Cartographique, 116 †; Atlas de Géographie Historique, 593 †; Prudent, F., et E. Anthoine, Atlas de Géographie Moderne, 593 †
Schubert, J., Wald und Niederschlag in Westpreussen und Posen und die Beeinflussung der Regen- und Schneemessung durch den Wind, 685 †
Schulz, A., Entwickelungsgeschichte der gegenwärtigen phanerogamen Flora und Pflanzendecke der Oberrheinischen Tiefebene und ihrer Umgebung, 580 †
Schulze, —, Zwischen Lüderitzbucht und Kubub, 473 †
Scotia—
Remarkable voyage of a Float thrown overboard during the voyage of the, 95
Scotland—
Geographical Spirit in, 9, 10
Journey through the Western Highlands of Scotland: R. Heron, 112 †
Late Quaternary Formations of Scotland: J. Geikie, 238 †
Plant Remains in the Scottish Peat Mosses: F. J. Lewis, 686 †
Scotland—*continued*.
Run-rig system of land cultivation, 45
Végétation des Highlands d'Écosse: M. Hardy, 686 †
Scott-Moncrieff, Sir C., remarks on "Irrigation in the United States," 424
Sea-water—
Bestimmung der elektrischen Leitfähigkeit des Meereswassers: E. Ruppin, 692 †
Oberflächentemperaturen des Meerwassers unweit der Niederländischen Küste: J. P. Van der Stok, 692 †
Sebu—
Reconnaissance du Sebou par la mission Dyé: E. Pobeguin, 688 †
Sechuan—
Géologie du Bassin rouge de la province de Se-tchouan: E. C. Abendanon, 471 †
Reise in Szechuan von Chungking über Land nach Chengtu, etc.: — Betz, 582 †
Sedimentation, Mud-cracks as a criterion of, J. Barrell on, 351
See, T. J. J., Nature and Origin of Volcanic Heat, 475 †
Seismology—
Frequency of After-shocks and Space-distribution of Seismic Waves: S. Kusakabe, 692 †
Velocità di propogazione delle perturbazioni sismiche in rapporto alla sismometria razionale: V. Monti, 240 †
Sela-la (pass), Tibet, 543
Selkirk Range, British Columbia, vol. 2: A. O. Wheeler, 688 †
Sella peak, Ruwenzori, height of, 140
Semper peak, Ruwenzori, height of, 140
Senegal—
Maps: Carte de Sénégal (Service Géo. de l'Afrique Occidentale Française), 481 †
Sensburg, W., Poggio Bracciolini und Nicolò de Conti in iher Bedeutung für die Geographie des Renaissancezeitalters, 589 †
Servia—
Pflanzengeographischen Karte von Serbien: L. Adamović, 85 §, 470 †
Siedlungen der serbischen Länder: P. Vujević, 581 †
Sethe, K., Eine ägyptische Expedition nach dem Libanon im 15. Jahrhundert v. Chr., 103 †
Severn river, Tidal bores as observed in the, 28
Seychelles—
First visits to, 150
Seychelles Archipelago: J. S. Gardiner, 148 *
Shackleton, E. H., A New British Antarctic Expedition, 329
Shangaan natives, Mashonaland, 22
Shanghai—
Climate of Shanghai, Notes on the, 1873–1902: J. de Moidrey, 686 †

Shan-si province, China, 622
Shara Muren river, North China, 548
Shari—
Connection between the Benue and Shari Basins, Surveys by Lieut. Audoin and Captain d'Adhémar, 571
Sharpe, Sir A., letter from, on Fall in Level of Lake Nyasa, 466
Sha-t'o-kuo district, North China, 548
Shea, J. G., Discovery and Exploration of the Mississippi Valley, 107†; Early Voyages up and down the Mississippi, 107†
Shengking—
Geology and Mineral Resource of Southern Shengking Province: K. Inouye and T. Ogawa, 357†
Shensi—
Mountains of Shen-si, Among the: B. Willis, 582†
Sherbinin, M. A., Galicians dwelling in Canada and their Origin, 359†
Sherring, C. A., Notes on the Bhotias of Almora and British Garhwal, 582†
Shibchilam, Himalaya, 208
Shih-la-ka Ho, North China, 546
Shik-pei Ho, North China, 549
Shiras, Hon. G., Photographing Wild Game with Flashlight and Camera, 241†
Shire river, drying up of, 467
Shoolbred, J. N., Tidal Régime of the River Mersey, 470†
Siam—
Lotus Land; being an Account of Country and People of Southern Siam: P. A. Thompson, 103†, 216§
Royal Survey Department, General Report on Operations of, 1903–1904.. 103†
Treaty of 1907 between France and Siam, 569
Siberia—
Fahrt nach dem Ob und dem Jenissei im Jahre 1905: J. Herrmann, 103†
Lande der Nord-Ostjaken: J. Pápay, 103†
Reiseberichte über Sibirien von Herberstein bis Ides: G. Henning, 103†
Russian Hydrographical Surveys, 630, 642
Yamarowka comme une source et sanatorium future pour la Sibérie orientale: J. de Talko-Hryncevicz, 103†
Sicily—
Queer Things about Sicily: D. Sladen and N. Lorimer, 356†
Recouvrement de la Sicilie, Sur la grande nappe de: A. M. Lugeon et E. Argand, 236†
Veduti degli avanzi dei monumenti antichi delle due Sicilie: B. Olivieri, 113†
Silesia—
Deutschen Grenzwacht in Schlesien: J. Partsch, 101†
Simplon—
"De Mont Simplono" (Historisches vom Simplonwege), 685†
Galleria del Sempione e i nuovi transiti internazionali: A. Michieli, 355†
History of the Simplon pass, 568
Simpson, G. C., Beaufort Scale of Wind-force. Report, etc., 476†
Sinai—
Researches in Sinai: W. M. F. Petrie and C. T. Currelly, 104†
Sind, Ancient history of, 528–531
Sindree lake, Sind, 528
Sivewright, R., Cutch and the Ran, 518*
Skeat, W. W., and C. O. Blagden, Pagan Races of the Malay Peninsula, 102†, 555§
Skinner, R. P., Abyssinia of To-day, 76§
Skottsberg, C., Observations on Vegetation of the Antarctic Sea, 690†; Vegetationsbilder aus Feuerland, von den Falkland-Inseln und von Südgeorgien, 120†
Sladen, D., and N. Lorimer, Queer things about Sicily, 356†
Slater, G., Inclosure of Common Fields considered geographically, 35*
Slav—
Germany, Slav and Low German Place-names, Herren Kühnel and Mucke on, 672
Sleeping sickness—
Mission française de la Maladie du Sommeil, Instructions pour les recherches à effectuer au Congo français par la: M. M. Bouvier, Giard et Laveran, 589†
Smith, B.: *see* Rastall, R. H.
Smith, G. E., From the Victoria Nyanza to Kilimanjaro, 249*; Grant awarded to, 567
Smith, S., British Empire in its true proportions, 693†
Smyth, C. E. O., Frenchman's (Baudin's) Rock, Kangaroo Island, 690†
Snell, F. J., Blackmore Country, 470†
Snow houses of the Eskimo, 506
Social Geography, Study of: G. W. Hoke, 64*
Solar radiation—
Grösse der solaren Wärmemengen, Ueber die: F. Hopfner, 588†
Verteilung der solaren Wärmestrahlung auf der Erde: F. Hopfner, 476†
Soley, J. C., on Circulation of water in the Gulf of Mexico, 677
Somaliland, Italian—
Maps: Schizzo dimostrativo della Colonia del Benadirredatto: C. Rossetti, 115†; Schizzo dimonstrativo della Somalia Italiana settentrionale, 115†
Somalia Italiana meridionale, L'ultima relazione sulla: A. Blessich, 105†
Sông-Gianh—
Hautes Vallées du Sông-Gianh: L. Cadière, 358†

Sonnblick in the Tauern, Hoar-frost Observations, 95
Sonora—
Evidences of glaciation in . . . Northern Sonora: F. J. Merrill, 474 †
Sorghak, Chinese Turkestan, Gold mining at, 608
Soshone Irrigation Project in Wyoming, 408
South Georgia—
Carte nautica inedita della Georgia Australe: A. Faustini, 587 †
Fauna of S. Georgia, Contributions to the: E. Lönnberg, 690 †
Vegetationsbilder . . . von Südgeorgien, C. Skottsberg, 120 †
Sowden, W. J., On Pearl-fishing in North Western Australia, 690 †
Sowman, G., Photographs of Upper Burma, 120 †
Spain—
Maps: Carte des routes d'Espagne: J. Méndez, 695 †; Valley of Almanzora, with portions of Provinces of Jaen, Granada, etc.: G. Gillman, 695 †
Modern Spain, 1815-1898: H. B. Clarke, 101 †
Spectacles d'outre-mer: J. Leclercq, 693 †
Speight, H., Upper Nidderdale, with the Forest of Knaresborough, 357 †, 453 §
Speilbergen, J. van, Voyage round the world (1614-1617): J. A. de Villiers, 361 †
Speke, Mount, Ruwenzori, 139, 460
Speleology—
Spéléologie au XX^e siècle: E. A. Martel, 240 †
Spencer, J. W., Survey of Niagara, 227
Spitaler, R., Periodische Verschiebungen der Schwerpunktes der Erde, 475 †
Spitsbergen—
Expedition to, Prince of Monaco's, 462
Spitsbergen: Sir M. Conway, 661 *
Sprigade, P., Karte von Togo, 245 †, 698 †; und M. Moisel, Grosser deutschen Kolonial-atlas, 245 †; Karte von Deutsch-Ostafrika, 481 †
Stairs peak, Ruwenzori, height of, 140
Stanford, E., A new map of Metropolitan Railways, etc., 364 †; Stanford's New Orographical Map of North America: H. J. Mackinder, 592 †
Stanley, Mount, Ruwenzori, 139
Stanmore, Lord, remarks on "The Seychelles Archipelago," 168
Stead, D. G., Fishes of Australia, 690 †
Steffen, H., Vorläufige Mitteilungen über das Erdbeben in Mittel-Chile vom 16 Aug., 1906. . 585 †
Stein, M. A., Expedition in Central Asia, 31; Hsüan-Tsung's Notice of P'i-mo and Marco Polo's Pein, 686 †
Steinmetz, K., Ein Vorstoss in die nordalbanischen Alpen, 357 †
Stephan, E., Südseekunst. Beiträge zur Kunst des Bismarck-Archipels und zur Urgeschichte der Kunst überhaupt, 475 †; und F. Graebner, Neu-Mecklenburg (Bismarck-Archipel), 475 †
Stieler, Hand Atlas, 117 †, 246 †, 366 †, 482 †, 593 †, 698 †
Stoddart, A. M., Life of Isabella Bird (Mrs. Bishop), 111 †, 452 §
Stoke-upon-Trent—
Memoirs of the Geological Survey. Geology of Country around Stoke-upon-Trent: W. Gibson and C. B. Wedd, 686 †
Stone Circles—
Observations of Stars made in some British Stone Circles: Sir N. Lockyer, 238 †
Storms—
Europe, Storms of February, 1907, in, 672
Stratilesco, T., From Carpathian to Pindus: pictures of Roumanian Country Life, 453 §, 470 †
Streams—
Self-purification of Streams: E. O. Jordan, 588 †
Strelasund channel, W. Deecke on origin of, 343
Strodtmann, S., Laichen und Wandern der Ostseefische, 477 †
Struck, A., Makedonische Fahrten, 470 †
Strunk, —, Relatorio sobre una viagem a S. Thomé, 473 †
Strutt, Hon. R. J., On the Distribution of Radium in the Earth's Crust. Part II. Sedimentary Rocks, 110 †, 475 †
Sturt's Creek, West Australia, 678
Sudan—
Au pays Soudanais: — Lanrezac, 104 †
Cook's Handbook for Egypt and the Sudan: E. A. W. Budge, 104 †
French: Etude Géophysique et Géologique sur le Fouta-Djallon: J. Chautard, 104 †
Mission Bonnel de Mézières. Au Soudan Anglo-Égyptien: A. B. de Mézières, 472 †
Plateau Central du Soudan Nigérien: — Desplagnes, 584 †
Westsudan, Oberflächenformen und die geologischen Verhältnisse des: G. Feilhauer, 584 †
Suffolk, Rainfall of: H. R. Mill, 222 §, 686 †
Sumatra—
Geologie von Sumatra: A. Tobler, 102 †
Loeboeq Ramo, Nota betreffende het landschap: C. Van de Velde, 102 †
Rokanstaatjes, Verslag nopens den politieken toestand in de: H. C. E. Quast, 471 †
Sun—
Laboratory Work with the Sun: J. P. Goode, 478 †
Under the: P. Landon, 454 §
Suna tribe, East Africa, 254
Sunda Islands, Deep sea soundings off, 575

Supan, A., on deep trough off south coast of Java, 575; Sunda Gräben am Südrande des Malaischen Archipels (Map), 591 †
Surface, G. T., Industrial Situation in the South, 107 †
Surveying—
Auxiliary Tables to facilitate calculations of Survey of India: S. G. Burrard, 691 †
Survey Manual for Land Records Officers: J. C. Clancey, 691 †
Sutherland, W. J., Geography and Life, 361 †
Sutton, J. R., Climate of East London, Cape Colony, 358 †
Svambera, V., Travaux Géographiques Tchèques. I. Le Congo, 583 †
Sweden—
Couverture de neige de la Suède Centrale et septentrionale: J. Westman, 581 †
Handbook on Sweden's History, Industries, etc.: Swedish Tourist Traffic Society, 581 †
Histoire de la Civilisation Page d'! La Suède et la Révolution Norwégienne: A. Mohn, 237 †
Moyennes mensuelles et annuelles de la température . . . à l'Observatoire de Stockholm: H. E. Hamberg, 237 †
Svenska Turistföreningens Årsskrift, 1906..237 †
Swettenham, Sir F., British Malaya, 103 †, 335 §
Switzerland—
Cartographie en Suisse: J.-J. Lochmann, 581 †
Geschichte der Glasmalerei in der Schweiz: H. Lehmann, 470 †
Groupes d'habitations du Val d'Anniviers comme types d'établissements humains: J. Brunhes et P. Girardin, 470 †
Population de la Suisse pendant l'Année 1904, Mouvement de la, 237 †
Sources vauclusiennes de la Doux et de la Noiraigne, Note sur l'origine des: H. Schardt, 237 †
Table de Récapitulation des Principaux Resultats des Observations hydrométriques suisses, 237 †
Wolfes in der Schweiz, zur Geschichte des: K. Bretscher, 84 §, 237 †
Syria—
Ägyptische Expedition nach dem Libanon im 15. Jahrhundert v. Chr.: K. Sethe, 103 †
Desert and the Sown: G. L. Bell, 445 §, 472 †
In a Syrian Saddle: A. Goodrich-Freer, 103 †

T.

Taber, S., Some local effects of the San Francisco Earthquake, 107 †
Tafel, A., explorations in North-East Tibet, 224
Tahiti—
Colonisation française à Tahiti: P. Brácconi, 239 †
Iles Sous-le-Vent de Tahiti et le régime de l'indigénat: P. Bracconi, 586 †
Taiwan—
Sketch of Eastern Taiwan: J. Öshima, 471 †
Tai-yuan Fu, Shan-si, 622
Takiakot, Tibet, 204
Talau islands, deep troughs on oceanic side of, 679
Talkessel—
Stuttgarter Talkessel- von alpinem Eis ausgehöhlt: M. Gugenhan, 469 †
Talko-Hryncevicz, J. de, Yamarowka comme une source et sanatorium future pour la Sibérie orientale, 103 †
Talman, C. F., Climatology of Haiti in the Eighteenth Century, 108 †
Tamil—
Marlborough's self-taught Series. Tamil Grammar self-taught: M. de Z. Wickremasinghe, 471 †
Ta-ming-ch'êng, North China, 546
Ta-ming-t'a (Famous Pagoda), North China, 546
Tanaka, A., Lake Yamanaka, 471 †; and H. Tanaka, On the Lake Yukunakinuma, Iwashiro Province, 471 †
Tancredi, A. M., Appunti di climatologia eritrea, 675 §, 688 †
Tanganyika—
Fishes, Collection of, made by W. A. Cunnington during Third Tanganyika Expedition, Report: G. A. Boulenger, 687 †
Geology of, 391
Heights of, 316
Levels of, 311
Zoological Results of Third Tanganyika Expedition, 583 †; Report on the *Hydrachnida*: J. N. Halbert, 359 †
Taodeni—
Expedition under Captain Cauvin and Lieut. Cortier, 347
Tarbagatai, researches in region of the, by V. A. Obrucheff, 457
Tarns—
Lakeland Tarns, R. H. Rastall and B. Smith's examination of, 343
Tarr, R. S., on changes in the Malaspina glacier, 460; Study of Glacial Erosion in Alaska, 572; and L. Martin, Recent Changes of Level in Yakutat Bay region, Alaska, 584 †
Tasman glacier, New Zealand, 349
Tavernier—
Lettre inédite du voyageur J. B. Tavernier (1664): E.-T. Hamy, 241 †
Tees, roll-wave on the, 23
Teit, J., Lillooet Indians, 359 †
Teleki, P. Graf, Je ein Monument der Kartographie des xv. und des xvi. Jahrhunderts im Ungarischen National-

museum zu Budapest, 692 †; Nachricht über die soeben entdeckte Ähnlichkeit des Globus von Rouen und der Karte Gastaldis? 111 †
Terrestrial magnetism—
Explanation of, and use of magnetic instruments, 495
Inclinaison magnétique terrestre aux époques préhistoriques: P. L. Mercanton, 241 †
Magnetic Survey of the North Pacific Ocean: Instruments, etc.: L. A. Bauer, 240 †
Magnetischen Deklination von Christoph Columbus, Ueber die Kenntnis der: G. Hellmann, 241 †
Texas—
"Indian Mounds" in Texas, A Few Notes on: I. H. Wentworth, 239 †
Small Sand Mounds in the Gulf Coast Country, Origin of the: J. A. Udden, 238 †
Vegetation of the Sotol Country in Texas: W. L. Bray, 585 †
Thalbitzer, W., Expedition to East Greenland, 232
Theiss, Die, Eine potamologische Studie: P. Vujević, 101 †
Thomas, N. W., Native Races of the British Empire. Natives of Australia, 108 †, 450 §
Thompson, H. S., Flora of Cyprus, 581 †
Thompson, P. A., Lotus Land; Account of People and Country of South Siam, 103 †, 216 §
Thomson, J. P., Report on Irrigation Scheme for the Murrumbidgee Valley, 230
Thoroddsen, T., Island. Grundriss der Geographie und Geologie, 101 †
Thurgau—
Morphologie des untern Thurgau: J. Früh, 581 †
Tian Shan—
Geologische Uebersicht über den Bau des zentralen Tian-Schan: H. Keidel, 357 †
Gesteine des Profils durch das Bayum-Kol-Tal im nördlichen Teil des zentralen Tian-Schan: S. Richarz, 357 †
Gesteine des Profils durch das südliche Musart-Tal im zentralen Tian-Schan: A. Kleinschmidt und H. Limbrock, 357 †
Tibet—
Convention between United Kingdom and China respecting Tibet, 472 †
Desolateness of, 601, 602
Expeditions: Sven Hedin's, 344, 539; A. Tafel's, 224; E. Zugmayer's, 87, 223
Pangong; a glacial lake in the Tibetan plateau: E. Huntington, 583 †
Rätsel des Matschu. Meine Tibet-Expedition: W. Filchner, 102 †
Summer Ride through Western Tibet: J. E. Duncan, 75 §
Tibet—*continued.*
Tibet the Mysterious: Sir T. H. Holdich, 74 §, 103 †
Tidal bores as observed in the river Severn, 28
Tides—
Cotidal Lines for the World: R. A. Harris, 241 †
T'ien-ch'iao, China, 288
Tierra del Fuego—
Vegetationsbilder aus Feuerland, etc.: C. Skottsberg, 120 †
Time—
Standard Time, Present status of the use of: E. E. Hayden, 691 †
Tobler, A., Zur Geologie von Sumatra, 102 †
Todd, C., Meteorological Observations made at Adelaide Observatory during 1902-1903..239 †
Togo—
Eisenerzlager von Banjeli in Togo: Koert, 238 †
Maps: Karte von Togo: P. Sprigade, 245 †, 698 †
Toro river, Central Africa, 571
Torrend, J., Sabæans on the Zambesi, 474 †
Toscanelli di Dieppe: G. Uzielli, 693 †
Tournai et le Tournaisis au XVI^e^ siècle au point de vue politique et social: A. Hocquet, 685 †
Tower, W. S., A Field for Studies in Regional Geography, 589 †
Trampler, G., Donau von Passau bis Linz, 580 †
Transport—
Entwicklung der Stadtischen Personenverkehrsmittel: E. Egerer, 241 †
Transvaal—
Geological Survey of the Transvaal, Report for 1903: F. P. Mennell, 69 §; Report for 1904. Transvaal Mines Department, 69 §
Irrigation in the Transvaal: F. A. Hurley, 238 †; Ditto: M. R. Collins, 688 †
Travels—
Totall Discourse of the Rare Adventures and Painefull Peregrinations . . . in Europe, Asia, and Affrica: W. Lithgow, 362 †
Tree-growth—
Certain Relations of Rainfall and Temperature to Tree-growth: H. Gannett, 587 †
Trinidad—
Oilfields of Trinidad: E. H. C. Craig, 239 †
Tristan da Cunha—
Further Correspondence relating to the Island of Tristan da Cunha, 227 §, 688 †
Tronnier, R., Grosstadtferne Deutschlands in den Jahren 1871 und 1905.. 685 †
Tropical Diseases Research Fund for

1906, Report of Advisory Committee for, 693 †
Tropical possession—
Industrial and Commercial Importance of a Tropical Possession: G. D. Hubbard, 477 †
Truckee-Carson Irrigation Project in Nevada, 409
Tsanpo river, Tibet, 543
Tschepe, P. A., Nan-Kiang. Eine geographisch-historische Studie, 582 †; Woher kommt der Name des Stromes Jangtsekiang? 582 †
Tsü-ching-kuan pass, China, 273
Tunis—
Maps: Algérie et Tunisie: G. Niox, 591 †; Carte de la Tunisie (Service Géo. de l'Armée), 115 †, 364 †
Mission du Commandant Huder à Tunis (1831): V. Demontès, 688 †
Turfan, Archæological Discoveries at, A. von Lecoq on, 224
Turkestan, Expedition in, M. Pelliot's, 223
Turkey—
Frontier between Egypt and Turkey agreed upon in 1906..88
Maps: Empire Ottoman. Division Administrative: R. Huber, 243 †; Map of Turkey (Top. Section, General Staff), 480 †
Turner, J. P., Moose and Wapiti of Manitoba, 359 †
Turugwe river, Mashonaland, 15
Tyrol—
Studien aus dem Paznaun. II. Der Jamtalferner bis 1897: G. Greim, 355 †

U.

Udden, J. A., Origin of the Small Sand Mounds in the Gulf Coast Country, 238 †
Uetrecht, E., Ablation der Rhone in ihrem Walliser Einzugsgebiete im Jahre 1904–05..237 †
Uganda—
Boundary of Western Uganda, Survey for, 88
Railway, 126
Uganda by Pen and Camera: C. W. Hattersley, 359 †
Uhle, M., Bericht über die Ergebnisse meiner südamerikanischen Reisen, 239 †
Uhlig, C., Regenbeobachtungen aus Deutschostafrika, 105 †
Ulug Kul, salt lake, Tibet, 603
Umberto peak, Ruwenzori, height of, 140
Umshabetsi river, Mashonaland, 15
Umtelekwe river, Mashonaland, 15
Uncompahgre valley Irrigation Project in Colorado, 409
United Kingdom—
Britain and the British Seas: H. J. Mackinder, 334 §, 470 †
United Kingdom—*continued.*
Clay-with-Flints: its Origin and Distribution: A. J. Jukes-Browne, 470 †
Maps: Bartholomew's Contour Motoring Map of the British Isles, 479 †
Scientific Geography. Book II. The British Isles: E. W. Heaton, 357 §, 454 †
United States—
Animal Wealth of the United States: Hon. F. E. Warren, 585 †
Areas of the, 676
Cold waves and frost in the United States: E. B. Garriott, 585 †
Earthquakes, Our greatest: M. L. Fuller, 474 †
Economic Geology, Contributions to: S. F. Emmons and E. C. Eckel, 689 †
Immigration and its effects upon the United States: P. F. Hall, 107 †
Immigration into the United States, Report on (Consular Reports), 689 †
Industrial Situation in the South: G. T. Surface, 107 †
Irrigation in the United States: its Geographical and Economical Results: J. H. Beacom, 400 *
Joutel's Journal of La Salle's Last Voyage, 1684–7..107 †
Maps: Geological Atlas of the United States (U.S. Geol. Survey), 365 †
Norsk-amerikanske Befolknings geografiske Udbredelse i de Forenede Stater: A. N. Kiaer, 689 †
Uruguay—
Anuario Estadístico de la República O. del Uruguay, 239 †
Utumbuwe river, New Guinea, 350
Uzielli, G., I Toscanelli di Dieppe, 693 †

V.

Vallentin, W., Paraguay: das Land der Guaranís, 474 †
Valleys—
Incised Meandering Valleys: W. M. Davis, 110 †
Valparaiso—
Catastrophe de Valparaiso: H. Bourdon, 689 †
Van der Lith, P.A., and others, Encyclopædie van Nederlandsch-Indie, 357 †
Van der Stok, J. P., Ueber Oberflächentemperaturen des Meerwassers unweit der Niederländischen Küste, 692 †; Wind en Water, 110 †
Van de Velde, C., Nota betreffende het landschap Loeboeq Ramo, 102 †
Varenius: S. Günther, 218 §
Varley, F. J., Photographs of Vijayanagar or Hampi, Madras Presidency, 120 †
Védy, —, Ethnographie Congolaise: Les riverains de l'Uélé, 583 †
Vegetation types—
Vegetationsbilder: G. Karsten and H. Schenck, 120 †, 248 †, 368 †, 700 †
Vera, V., Formación de tierras en el seno de las aguas, 476 †

Vermont—
Terraces of the West River: E. F. Fisher, 689 †
Verona—
Descrizione di Verona e della sua provincia, 113 †
Vesuvius—
Avalanches sèches et les torrents boueux de l'éruption du Vésuve: A. Lacroix, 236 †
Conglomérats des explosions vulcaniennes du Vésuve, etc.: A. Lacroix, 236 †
Disputed Vesuvian Eruptions: C. R. Eastman, 469 †
Eruption des Vesuvs, Bilder von der letzten: O. Jackel, 581 †
Éruption du Vésuve et en particulier sur les phénomènes explosifs: A. Lacroix, 236 †
Eruption of Mount Vesuvius, April, 1906: T. A. Jaggar, 236; ditto: G. de Lorenzo, 469 †; Ditto: W. H. Hobbs, 581 †
Victoria—
Merribee Gorge, A Field Lesson at, etc., 586 †
Victoria Nyanza—
From the Victoria Nyanza to Kilimanjaro: G. E. Smith, 249 *
Heights of, 316
Levels of, 307
Viczián, E., Ueber die Wasserkräfte Ungarns, 469 †
Vienna—
Geographical Society, Jubilee of, 95
Maps: Plan von Wien (Artaria & Co.), 591 †
Vignaud, H., Sophus Ruge et ses vues sur Colomb, 111 †
Vijayanagar, Photographs of: F. J. Varley, 120 †
Villard, P., Sur l'Aurore boréale, 110 †
Villatte, N., De Ouargla au Tidikelt et vers Tombouctou, 106 †
Villiers, C. H., remarks on "From the Victoria Nyanza to Kilimanjaro," 272
Villiers, J. A. J. de, East and West Indian Mirror, being an account of J. van Speilbergen's Voyage round the World, 361 †
Vincent, J. E., Highways and Byways in Berkshire, 102 †
Virāwāh, Sind, 530
Virginia—
Luray Caverns, 239 †
Vischer, H., Journey across the Sahara, 88
Vittorio Emanuele peak, Ruwenzori, height of, 139
Voeltzkow, A., Bericht über eine Reise nach Ost-Afrika . . . der Riffe und Inseln des westlichen Indischen Ozeans. VIII. Ceylon, 582 †; Die Comoren, 458 §, 584 †
Volcanic Heat, Nature and Origin of: T. J. J. See, 475 †
Volcanoes—
Beziehungen des Meeres zum Vulkanismus, Ueber: W. Krebs und K. Sapper, 477 †
Masudi's statements respecting Volcanoes, 464
Volcanoes and Radioactivity: C. E. Dutton, 241 †, 477 †
Vujević, P., Die Theiss. Eine potamologische Studie, 101 †; Siedlungen der serbischen Länder, 581 †

W.

Waghenaer, L. J., Speighel der Zeevaerdt, van de navigatie der Westersche Zee, etc., 113 †
Wallace, D., Lure of the Labrador Wild, 106 †
Wallace, L. A., North-Eastern Rhodesia, 369 *
Waller, Mount, Rhodesia, Geology of, 393
Wallis, C. B., West African Warfare, 359 †
Wandorobo tribe and language, 254
Ward, R. de C., Changes of Climate, 691 †; Classification of Climates, 587 †
Warren, Hon. F. E., Animal Wealth of the United States, 585 †
Warren, P. S., Ceylon Administration Reports, 1905, Survey Report, 582 †
Washington, Yakima valley Irrigation Project, 411
Water—
Flow of Underground Water: W. R. Baldwin-Wiseman, 588 †
Influence of Surface Waters on Ground Water, Prof. Kastner on, 679
Water transport (*see also* Canals)—
Ocean and Inland Water Transportation: E. R. Johnson, 219 §
Waterways—
Our Waterways: U. A. Forbes and W. H. Ashford, 219 §
Watts, F., Report on Agricultural Industries of Montserrat, 108 †; Report on Sugar Industry in Antigua and St. Kitts, 239 †
Wauters, C., El dique de embalse del Cadillal, 689 †
Waves—
Allure réelle des eaux et des vents enregistrée par les sables: J. Brunhes, 588 †
Houle et les vagues: A. Berget, 476 †
Progressive Waves in Rivers: V. Cornish, 23 *
Stationary Waves in Running Water: V. W. Ekman, 588 †
Weather—
Some facts about the Weather: W. Marriott, 588 †
Wedd, C. B.: *see* Gibson, W.
Wehrli, H. J., Zur Wirtschafts-Geographie von Ober Burma und den Nördlichen Shan-Staaten, 687 †
Wei-ch'ang region, China, 182, 183

Weismann peak, Ruwenzori, height of, 140
Wellcome Research Laboratories at the Gordon Memorial College, Khartoum, Second Report of the: A. Balfour, 583 †
Wendland, H., Einfluss der Staatlichen Besiedlung in Posen und Westpreussen, 100 †
Wentworth, I. H., A few Notes on "Indian Mounds" in Texas, 239 †
Werner, L. G., Sundgauer Hügelland im Ober-Elsass, 100 †
Werribee Gorge, A Field Lesson at, etc., 586 †
Wessex Village Community, 49
West, W. and G. S., Comparative Study of the Plankton of some Irish Lakes, 238 †
West—
From East to West: Sir H. Jerningham, 454 §, 478 †
West Indies—
Voyage au pays du cacao et du sucre de canne: T. Dufau, 690 †
Vulcangebieten Mittelamerikas und Westindiens, In dem: K. Sapper, 558 §
Westman, J., Sur la couverture de neige de la Suède centrale et septentrionale, 581 †
Weule, K. Mitteleuropa und Nordeuropa, 356 †; Scientific researches in German East Africa, 457
Wheeler, A. O., The Selkirk Range, British Columbia, vol. 2, 688 †
Whitbeck, R. H., Fundamental and the Incidental in Geography, 112 †
Whitehouse, B., letter on "Heights of African Lakes," 579; remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 321
White sea—
Russian Hydrographical Surveys, 630, 640
Wickremasinghe, M. de Z., Tamil Grammar self-taught, 471 †
Wieser, F. R. von: *see* Oberhummer, E.
Wiesner, J., Untersuchungen über den Lichtgenuss der Pflanzen im Yellowstonegebiete, 474 †
Wijkberg, M., and W. Arppe, Karta öfver Storfurstendömet Finland, 242 †
Wilamowitz-Moellendorff, Von, Ueber die ionische Wanderung, 101 †
Wild Game—
Photographing Wild Game with Flashlight and Camera: Hon. G. Shiras, 241 †
Wilda, J., Amerika-Wanderungen eines Deutschen, 108 †
Wilkitsky, A. de, Hydrographic surveys in the Polar Ocean, 642; Notice sur l'Emploi du "Calculateur de latitude," 587 †
Willcox, O. W., Viscous *versus* Granular Theory of Glacial Motion, 559 §, 692 †
Williams, A., Romance of Early Exploration, 477 †
Williams, G. B., Rainfall of the East Africa Protectorate, 654 *
Williams, L., Granada; Memories . . . and Impressions, 101 †
Willis, B., Among the mountains of Shen-si, 582 †
Wilson, G., remarks on "The Most Reliable Values of Heights of Central African Lakes and Mountains," 321, 326
Wilson, W., Northern Kalahari Desert, 474 †
Wilson-Fox, H., remarks on "North-Eastern Rhodesia," 398
Wind—
Beaufort Scale of Wind-force. Reports and Notes: G. C. Simpson and others, 476 †
Föhns, Beiträge zur Dynamite des: H. von Ficker, 110 †
Staub-, Vogel- und Insekten-Transporte durch Luftströmungen besonders aus der westlichen Sahara: W. Krebs, 476 †
Wind en Water: J. P. Van der Stok, 110 †
Wind river, Canada, 348
Wingate, A. W. S., Nine Years' Survey and Exploration in Northern and Central China, 174 *, 273 *
Wissemann, W., Oberflachenströmungen des Schwarzen Meeres, 240 †
Wissmann, H. von, Bedeutung, in der Entdeckungsgeschichte Afrikas und in Deutschlands Kolonialgeschichte: R. Schmidt, 112 †
Wiszwianski, H., Die Faktoren der Wüstenbildnung, 361 †
Woeikow, A., Verteilung der Bevölkerung auf der Erde (map), 247 †
Wolf—
Disappearance of the Wolf in France, 343
Wolkenhauer, A., War die magnetische Deklination vor Kolumbus erster Reise nach Amerika tatsächlich unbekannt? 588 †
Wollaston peak, Ruwenzori, height of, 140
Woltereck, R., Director for Limnological Station in Lower Austria, 222
Woodhead, T. W., Ecology of Woodland Plants in Neighbourhood of Huddersfield, 686 †
World—
Atlas of the World's Commerce: J. G. Bartholomew, 116 †, 246 †, 365 †, 592 †
Philips' Handy-Volume Atlas of the World: E. G. Ravenstein, 593 †
World of To-day: A. R. H. Moncrieff, 112 †, 671 §
Wu-shi Ling, China, 619
Wüstenhagen, H., Beiträge zur Siedelungskunde des Ostharzes, 580 †
Wu-t'ai, or Five Peaks, China, 275, 276
Wu-t'ai Shan, the Lesser, 199
Wyoming, Soshone Irrigation Project, 408

Y.

Yakima Valley Irrigation Project in Washington, 411

Yamarowka comme une source et sanatorium future pour la Sibérie orientale: J. de Talko-Hyencevicz, 103 †

Yang-ch'ang Ho, North China, 546

Yang-shu-mu Ho, North China, 549

Yang-tse (tzŭ) Kiang—
- Name des Stromes Jangtsekiang, Woher kommt der: P. A. Tschepe, 582 †
- Nan-Kiang, Der, Eine geographisch-historische Studie: P. A. Tschepe, 582 †
- Railway route, proposed, along the, 287

Yap—
- Karolineninsel Jap, 231 §, 360 †

Yate, C. E., remarks on "Cutch and the Ran," 537

Year-Book—
- Livingstone College Year-Book, 241 †

Yellow river, or Huang Ho, 190

Yellowstone District—
- Lichtgenuss der Pflanzen im Yellowstonegebiete, Untersuchungen über den: J Wiesner, 474 †

Yellowstone river, Montana, Irrigation Projects, 410

Yen-an Fu, China, 621

Yenisei river—
- Fahrt nach dem Ob und dem Jenissei, 1905: J. Hermann, 103 †

Yolanda peak, Ruwenzori, height of, 140

York—
- Handbook to York and District: G. A. Auden, 238 †

Yorkshire—
- Rainfall of East Riding of: H. R. Mill, 222 §, 686 †

Young, Sir Allen, remarks on "To the North Magnetic Pole and through the North-West Passage," 515

Young, F., Christopher Columbus and the New World of his discovery, 477 †

Young, H. E. W., Photographs of Asiatic Turkey, 118 †

Yukon—
- Surveys in Yukon and Mackenzie Districts by C. Camsell, 348

Z.

Zalles, J. E., Quinientas Leguas a traves de Bolivia, 689 †

Zambezi—
- Geology of Valley of, 390
- Railway route between Beira and the Zambezi, 458
- Sabæans on the Zambesi: J. Torrend, 474 †
- Zambezi-Nyasa Watershed, Geology of, 389

Zegarra, E. C., El ferrocarril de Paita al Marañón, 586 †

Zels, L., Le Kalahari au pointe de vue de la géographie humaine, 688 †

Zeri, A., Alessandro Malaspina e la relazione del suo viaggio (1789–1794).. 589 †

Zimbabwe—
- Letter from R. N. Hall on Prof. MacIver's statement and the Discovery of Nanking China, 682

Zimmermann, —, Bericht über eine Bereisung des Mandara-Gebirges, 105 †

Zone—
- Ältere Zonenlehre der Griechen: H. Berger, 478 †

Zubéchie Gorge, Kuen Lun, 604, 607

Zugmayer, E., Eine Reise durch Vorderasien im Jahre 1904..454 §; Expedition to Tibet, 87, 223

INDEX TO MAPS.

EUROPE.

England: Inclosure of Common Fields, considered geographicaliy, Sketch-maps: G. Slater, 37–51
Russian Hydrographical Survey—
Baltic Sea, showing State of Hydrographic Work up to 1906..629†
Black Sea, showing State of Hydrographic Work up to 1906..646
Bothnia, Gulf of, showing State of Hydrographic Work up to 1906..641
Caspian Sea, showing State of Hydrographic Work up to 1906..633
Russian Hydrographical Survey—*contd.*
Finland, Gulf of, showing State of Hydrographic Work up to 1906..643
Pacific Ocean, showing State of Hydrographic Work up to 1906..647
Plans showing State of Hydrographic Work up to 1906..627, 628
Polar Ocean, showing State of Hydrographic Work up to 1906..637
White Sea, showing State of Hydrographic Work up to 1906..631

ASIA.

Bengal, Bay of, New Island in, Sketch-map: E. J. Headlam, 432
Central Asia: Map showing the Route of Major C. D. Bruce from Leh to Peking, 700
Chih-Li, Outer, Sketch-map of part of: A. W. S. Wingate, 368
Chih-Li Province, Outer, Sketch-map: J. Hedley, 547
China, Bailey-Willis Survey Sheet to illustrate routes surveyed by A. W. S. Wingate's party, 177
China, Northern and Central, Sketch-map: A. W. S. Wingate, 175
China: Routes and Rivers in An-Hui: A. W. S. Wingate, 368
Cutch and the Ran, Maps: R. Sivewright, 596
Liao River System, Sketch-map: A. W. S. Wingate, 368
Seychelles Group, Central Islands: J. S. Gardiner, 248

AFRICA.

Africa, East, Sketch-map: G. E. Smith, 251
Africa, East Central: T. T. Behrens, 317
Africa Protectorate, East, showing Approximate Distribution of Rainfall, Map and Diagrams, 654–659
Kordofan: Map of Dar Homr, 700
Nigeria-Kamerun Boundary, Sketch-map, 459
Nigeria, Northern, Parts of Provinces of Kabba and Bassa: D. Cator, 368
Nigeria, Southern, Structure of, Sketch-map: J. Parkinson, 61
Nigeria, Western Frontier, Sketch-map, 570
Rhodesia, North-Eastern: O. L. Beringer, 484
Rhodesia, South-Eastern, Sketch-map: V. Dickins, 19
Ruwenzori, Peaks, Passes, and Glaciers: Duke of the Abruzzi, 248
Turco-Egyptian Boundary, as demarcated in 1906..89

AMERICA.

Colorado River, Lower, Relief Map of the, showing Irrigable Lands: J. H. Beacom, 417
Costa-Rica and Panama Boundary, 1905, Sketch-map, 573
San Francisco and district, Sketch-map

AMERICA—*continued.*

showing principal Faults: J. W. Redway, 437
United States, Milk River Irrigation project, Sketch-map: J. H. Beacom, 415
United States, Western, Sketch-map showing Irrigable Areas: J. H. Beacom, 408

ARCTIC.

Arctic, Map to illustrate Voyage and Explorations of R. Amundsen, 596
Spitsbergen, Part of, Sketch-map showing routes traversed by Prince of Monaco's Expedition, 463
Spitsbergen, Supposed position reached by Barents on June 18, 1596..662

ILLUSTRATIONS AND DIAGRAMS.

ASIA.

Asia, from Leh to Peking—
Fortified post (Kurgan) near Kara Nor, Ancient remains of, 613
Kuen Lun gorges, Crossing the frozen stream in the, 609
Lob Nor, near, Midday rest at a water-hole, 603
Mountain peaks from the first pass into the Kuen Lun range, View of, 605
Natural clay tower in the Kum Tag desert, 617
Sand cliff forming southern shore of ancient lake or sea of the central basin of Asia, Exposed rough section of, 599
Surveyor Lall Sing and Rai Sahib at work on top of Lanak La, 601
Bengal, Bay of—
General appearance of new island on approaching from the eastward, 431
General view of south end of new island, with summit, 435
Watching action of an active crater, 435
Watching the liquid mud exuding from small crater, 434
China, Northern and Central—
Conglomerate column at Je-Ho, 181
En route from Tzu-li Hsien to Wan Hsien, 301
Frequent sight in Central Ngan-Hui, 281
Golden pagoda in temple of Wu-Tai Shan, 193
China, Northern and Central—*continued.*
Hui-Chou Prefecture, Beautiful valley of, 289
Hui-Chou sculpture, Some specimens of, 297
Li Hung-Chang, Grave of, 285
Pai-Hua Shan, View from, 179
Potala at Je-Ho, 185
Ruins of Ancient Temple on Summit of Chung-T'ai, 197
Tomb prepared for H.I.M. the Dowager-Empress of China at Tung-Ling, 187
Typical Road in Mountains of Northern China, 277
View looking east from wall of Hsiu-ning city, 293
Wu-t'ai Shan, View of, 191
Seychelles archipelago—
Chateau Margot, View from, 149
Double coconut trees in valley of Coco de Mer, Praslin, 151
Jungle on Morne Seychellois, 161
Mangroves of the coast, 155
On cascade at 1400 feet, 159
Reed-covered marsh, with *Pandanus Hornei*, 165
Sebert, Mount, 1400 feet. Cliff covered with vegetation, 163
Storm-swept summit of Mount Sebert, 157
Trois Freres, View along north side of, 153
Typical mill of the best class used for expressing coconut oil, 167

AFRICA.

Central African Lakes and Mountains—
Elgon, 311
Kenya from south-west, 309
Kilimanjaro from north-west, 308
Meru from the south, 310
Mfumbiro, Outlines, etc., 313
Ruwenzori: Mount Stanley, 312
Nigeria, Southern—
Akoko Hills, View from top of, 63
Hill south-south-west of Iduani, Akoko hills, 59
Rhodesia, North-Eastern—
Bangweulu, Lake, South end of, 387
Bridge over the Kafue river, 377
Chimanabui river, 373
Rhodesia, North-Eastern—*continued.*
Ilonda Hill, Tanganyika, View from, 383
Luangwa river, 371
Lukusya river, 375
Muchinga mountains, View from, 381
Tanganyika, Lake, South end of, 385
Snows of the Nile—
Bujuku valley and Scott-Elliot pass, 144
Caravan near Bweya, on road to Fort Portal, 128
King Edward peak, seen from north-west, 142
Mobuku valley, between Yolanda and Bihunga and Portal peaks, 144

Snows of the Nile—*continued.*
Ruwenzori, Highest peaks of, 138
Ruwenzori: Queen Margherita and Queen Alexandra peaks from Lake Bujuku, 140
Ruwenzori: Mount Stanley and Mount Speke from Butiti, 328
Victoria Nyanza to Kilimanjaro—
Chala, Lake, 259
Forest vegetation at 6500 feet, 256
Victoria Nyanza to Kilimanjaro—*contd.*
Gwaso Nyiro, near the Natron See, 254
Jipé, Lake, 261
Lolgorossien mountains and Langaraloriga, looking north-east, 257
Mara river, or Ngare Dabash, in half flood, 253
Ndere, A typical scene, 252
Ngai, still active, 255

AMERICA.

San Francisco Earthquake—
Lateral shift of fault, 438, 439
Plowed land along earthquake rift, 438
Twist and displacement of a country road, 439
United States, Irrigation in—
California, Southern, Community of small irrigated farms in, 421
Cemented cutting to prevent water from running away underground, 405
United States, Irrigation in—*continued.*
Dam across cañon, 409
Home near Phœnix, Arizona, showing effect of irrigation, 419
Power site just below the North Platte dam site, looking down cañon, 413
Salt river project, Arizona, 403
Truckee canal, looking down through one of the rock cuts, 411

ARCTIC.

North Magnetic Pole and North-West Passage—
Driftwood at King Point, 497
Eskimo building snow-huts, 505
Eskimo camp at King Point, 499
Eskimo camp near Gjöa harbour, 491
North Magnetic Pole and North-West Passage—*continued.*
Eskimo in snow-hut, 509
Godhavn, 489
Interior of snow-hut, 501
Vegetation at King Point, 493

GENERAL.

Amundsen, R., Portrait of, 487
Progressive Waves in Rivers—
Leaping wave, Whirlpool rapids, Niagara, 30
Roll-waves in the Grünnbach conduit, 26
Progressive Waves in Rivers—*continued.*
Roll-wave leaping outfall of Grünnbach conduit, 26
Stationary waves on river Aare, 30

END OF VOL. XXIX.